

592 0143

ESTABLISHING AN OPTIMUM CARRYING CAPACITY FOR WATERCRAFT ON THE WHITE RIVER

ABSTRACT

During the summer of 1983 the White Cloud Ranger District received a special use application from an individual wanting an outfitter-guide permit to use National Forest land for launching as many as 300-600 innertubes per day on the White River. The permit would start during the summer of 1984.

The likelihood of creating negative social and environmental impacts to the White River environment and its users by adding 300 watercraft per day is great. Rather than deny the request outright or hastily attempt to justify a permit of this potential impact would be poor business on the part of the Forest Service. It was decided the best approach would be to initiate a study to determine what the optimum long range carrying capacity was for watercraft on the White River.

This study establishes an optimum carrying capacity for watercraft on the White River. Social, physical and management carrying capacities are defined and calculated for the study area. The three carrying capacities are first compared to each other; then to established carrying capacities on the Pine and the Pere Marquette rivers and finally they are compared to current management objectives for the study area. The carrying capacity satisfying most of the management objectives for the White River including criteria listed in the recreation opportunity spectrum is selected as the Optimum Carrying Capacity for the study area.

The optimum carrying capacity is then super-imposed on the White River's projected watercraft use figures to the year 2030. If projected use stays below the optimum carrying capacity the outfitter-guide application will be recommended for approval. If it exceeds the optimum carrying capacity the application will be rejected.

"This paper was prepared as a student project in partial fulfillment of the requirements of the Professional Development for Outdoor Recreation Management program at Clemson University. It in no way reflects U.S. Forest Service policy nor are the opinions expressed those of anyone other than the author."

ACKNOWLEDGEMENTS

Bob Lockhart - U.S.F.S. Cadillac, Michigan

Dave Lime - U.S.F.S. St. Paul, Minnesota

Warren Bacon - U.S.F.S. Portland, Oregon

Tom Gilbert - N.P.S. Omaha, Nebraska

Paula Busch - U.S.F.S. White Cloud, Michigan

Table of Contents

	<u>PAGE</u>
I. Introduction and Statement of Problem	1
A. Introduction	2
B. The Study Area	3
C. Significance	18
D. Statement of Problem	22
E. Hypotheses	23
F. Delimitations	23
G. Definitions	24
H. Limitations	26
II. Literature Review	28
III. Procedures	34
A. Statement of Method	35
B. Compile Management Objectives	36
C. Define and Calculate the Social Carrying Capacity	36
D. Define and Calculate the Physical Carrying Capacity	37
E. Define and Calculate the ROS Carrying Capacity	37
F. Compare the three Carrying Capacities and Select the Best One	38
G. Recommendation Concerning the Outfitter- Guide Permit	38
IV. Analysis of Data	39
A. Introduction	40
B. Management Objectives	44
C. The Social Carrying Capacity	47
D. The Physical Carrying Capacity	54
E. The ROS (Experience Level) Carrying Capacity	69
F. Comparing the Three Carrying Capacities and Selecting the Preferred One	85
G. Recommendation Concerning the Outfitter- Guide Permit	91
V. Summary and Conclusions	94
Bibliography	98
Appendices	103

LIST OF FIGURES

	<u>PAGE</u>
1.1 Map of State of Michigan	4
1.2 County Map of West Michigan	5
1.3 Forest Map Showing the White River Study Area, The White River Semi-Primitive Motorized Area and Major Points of Interest	11
4.1 Recreation Opportunity Spectrum	72
4.2 Comparison of the Three Carrying Capacities to the Established Carrying Capacities for the Pine and Pere Marquette Rivers	87

LIST OF TABLES

	<u>PAGE</u>
1.1 Total Estimated Watercraft Use by Origin for 1983 on the White River	12
1.2 General Assumptions about the American Public	14
1.3 Indexes of Demand for Canoeing	16
1.4 Demand for Canoeing on the White River	16
4.1 Social Capacities Recommended by State and Federal Agencies	52
4.2 Soils Capability for Sustaining Current and Projected Recreation use at 7 Access sites on the White River	58
4.3 Capability Criteria for Rating Soil Capability	59
4.4 Stream Water Quality Index for the White River	62
4.5 Stream Water Quality Index for the Pine and Pere Marquette Rivers	63
4.6 Canoe Launching Capacity at Access Points on the White River	67
4.7 Summary of Findings for the Various Sources Cited	80
4.8 The Optimum Capacity Range for Boating on the White River	84
4.9 Comparison of Social, Physical and ROS Carrying Capacities by Numbers of Watercraft	86
4.10 Comparison Matrix of the Three Carrying Capacities against Management Objectives	88

CHAPTER I

Introduction and Statement of Problem

A. INTRODUCTION

During the summer of 1983 the White Cloud Ranger District received a special use application from an individual wanting an outfitter-guide permit to use National Forest land for launching as many as 300-600 innertubes per day on the White River. The permit would start during the summer of 1984.

The likelihood of creating negative social and environmental impacts to the White River environment and its users by adding 300 watercraft per day is great. Rather than deny the request outright or hastily attempt to justify a permit of this potential impact would be poor business on the part of the Forest Service.

It was decided the best approach would be to initiate a study to determine what the optimum long range carrying capacity was for watercraft on the White River. The study would determine if the pending Outfitter-Guide application would be recommended for further environmental evaluation and approval. The study would also make recommendations as to what action the Forest Service should take regarding future watercraft livery applications. The individual was informed of this decision and is waiting for the results of this study and Forest Service action on the special use application.

B. The Study Area

1. Stream Characteristics

The White River is located in the southern portion of the Manistee National Forest in Newaygo, Oceana, and Muskegon counties, in west central lower Michigan (fig. 1.1 and 1.2). It is a small, state-designated country scenic river readily accessible (one-days drive) to over 30 million people living in the metropolitan areas of the upper midwest. Large cities within two hours driving distance are: Muskegon (54,000), Grand Rapids (200,000), Kalamazoo (86,000), Lansing (135,000), Saginaw (92,000), and Midland (35,000). The cities of Detroit and Chicago are four hours away by car.

The river originates in north central Newaygo County and flows in a southwesterly direction into Lake Michigan. The White River system drains a surface area of approximately 300,000 acres and includes about 253 linear miles of stream. The stretch of river involved in this study, from Hesperia to Fruitvale Road Bridge, averages 70 feet in width; is fairly swift; and flows over a sand and gravel bottom. From Pines Point Campground to White Lake, the river has a moderate current, sandy bottom, meanders considerably and has many oxbows. According to U.S. Geological Survey Streamflow records, the average

Fig. 1.1 State of Michigan

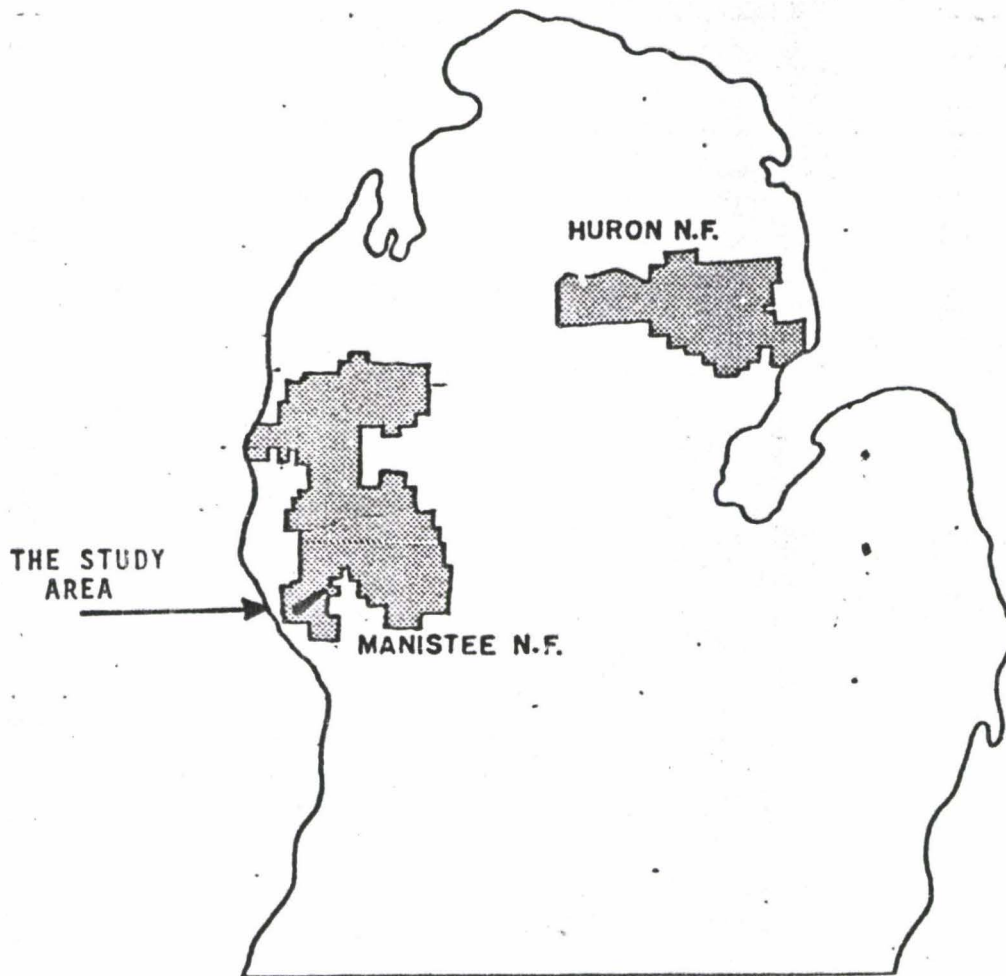
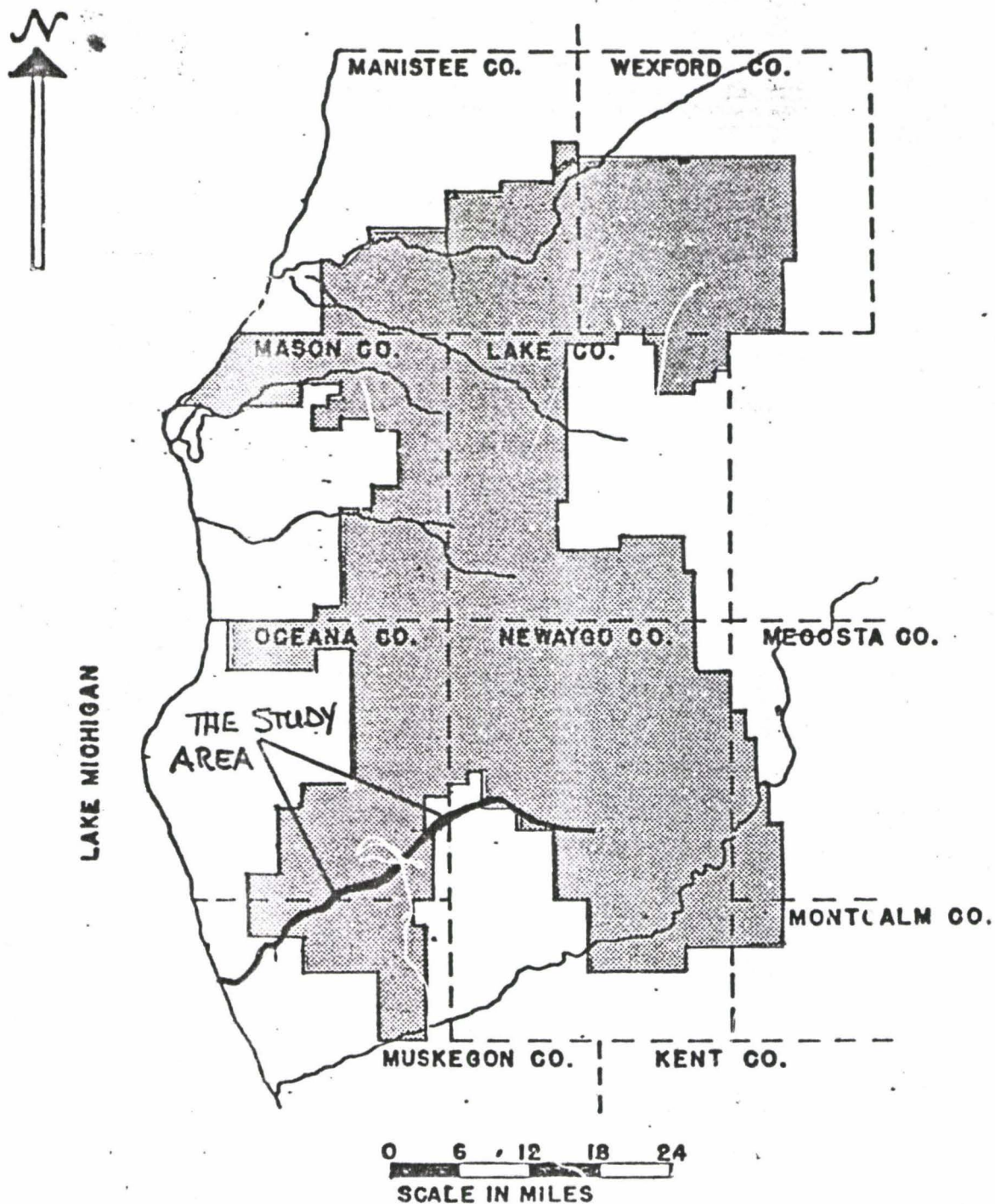


Fig. 1.2 County Map of West Michigan



flow near the Muskegon County line over the last 15 years has been 389 cubic feet per second.

2. Soils

Soils in the White River bottoms are poorly drained, alluvial in origin and were developed in sands and sandy loams. They occur on nearly level bottom lands along much of the mainstream and its tributaries and are subject to flooding especially in spring. They also have seasonally high water tables. These soils place severe limitations on residential, cottage and intensive campground development due to high water tables, periodic flooding, severe limitations for septic tank drain fields and the possible contamination of shallow wells.

3. Vegetation

Tag alder, dogwood and white cedar form the dominant vegetative cover along the streams. Vegetation on lands adjacent to the mainstream and tributaries varies from lowland hardwoods in lowlands sites to oak, northern hardwoods, aspen and pine on the higher sites. All except the pine are second growth uneven-aged stands resulting from natural reproduction and selective cutting following the original logging operations. Most of the pine types are plantations established by the U.S. Forest Service on federally owned land.

4. Climate

The area has an average annual precipitation of about 32

inches with a fairly uniform distribution throughout the year. Average annual snowfall is 70 inches. The average annual temperature is 46° F. with the highest monthly maximum temperature occurring in July (70° F.) and the lowest monthly minimum temperature occurring in February (22° F.).

5. Fisheries

The lower White is a popular and important steelhead spawning stream. It offers good fly fishing during the June Drake hatches.

For about 15 miles below Hesperia, the White flows rapidly over good gravel bottom. The stream here contains a few lunker brown trout and could produce improved trout fishing through trout stocking and possibly chemical reclamation.

6. Wildlife Observation and Hunting

The White River watershed is not an important waterfowl area although there is some production of dabbling ducks on most of the natural waters of the watershed and on some artificial ponds. Fur species common to the watershed include muskrats, mink, raccoon, foxes, beaver and a limited number of otter.

7. Ownership

Of the 25 miles of stream in this study, 15 miles of

frontage or 60% are in public ownership. The bulk of this frontage is located between Taylor Bridge and Fruitvale Road where over 80% is in National Forest ownership.

8. Land Use

The entire stretch of river between Taylor Bridge and Fruitvale Road Bridge has a total of 50 cottages. Of this number 41 are within St. Huberts, a summer home development located about a mile and a half below Taylor Bridge. Below St. Huberts only two other homes are visible from the river.

9. Historic and Archeological

The White River below Hesperia historically has been used as a waterway for transportation by native Americans, early settlers, and lumbermen. The last 100 years have seen the use of the river for log drivers and fur trapping fade and a recreational waterway for canoes and sport fishing emerge. Analysis show that close to 90% of all existing prehistoric sites within Michigan are within 1 mile of a lake, river, or stream. This indicates that the White River has a high potential for prehistoric and historic sites. (Louis, Langhorne, Van Arsdel - 1978).

10. Private Recreation Areas

Private camping facilities in the vicinity of the White River are numerous. Thirty-five campgrounds provide 1,705 campsites to the recreationist in the three county area of the watershed. Other private sources providing

by fishermen or people exploring the river.

Canoes are available for rent at liveries located in White Cloud, Hesperia, and on Fruitvale Road at the Oceana, Muskegon county line.

13. Special State Designation

The White River system represents the southernmost major trout stream in the Lake Michigan drainage. Except for areas around Hesperia and White Cloud, much of the river, especially the middle and lower reaches, are scenic, crossed by few bridges, wild in nature and intrusions by man are few. Development of recreation homes and homesites on the White River have increased in past years, however, there are still many miles of stream in a natural state with scenic and other recreational values worth preserving. Because of this concern, a White River planning group was formed in February 1974, to draft a plan to regulate future development and use for the protection of the natural character of the White River.

This planning group was authorized by the State of Michigan Natural Rivers Act of 1970. The purpose of this Act was to establish a system of "natural" rivers in the state and to provide for their preservation, protection and enhancement. After public review the plan was approved

and the White River was officially designated a State Country Scenic River June 13, 1975.

Briefly, a Country Scenic River is a stream in an agricultural setting with narrow bands of woods or pastoral borders. Farms and other developments may be visible from the river and it may be readily accessible by road. It may have undergone some impounding and its waters should meet established water quality standards. (White River Planning Group 1975).

14. ROS Classification

Recreation Opportunity Spectrum Mapping and Classification is a part of the Forest Service Land Management Planning (LMP) Process. This phase of LMP has been completed for the Huron-Manistee National Forests (appendix A) and as a result the White River (study area) and adjoining land areas were classified as a potential semi-primitive motorized area (fig. 1.3).

Semi-primitive motorized areas are managed so as to protect the natural setting, have low to moderate human contact frequency and on-site controls are present but subtle.

15. Present Watercraft Use on the White River

The information gathered to estimate 1983 watercraft use

within the study area originated not from user counts but from information supplied by canoe liveries, Boy Scouts of America and other organizational camps using the study area, and knowledge and experience of Forest Service personnel.

Table 1.1 -- Total Estimated
Watercraft Use by Origin
for 1983 on the White River
from Hesperia to Fruitvale Road

Origin	Number of Canoes	Number of Visitors	%
Liveries	3100	6500 <u>1/</u>	70
Boy Scouts of America	530	1113	12
Private	400	840	10
Camp Pendoulon	270	567	6
Camp Tall Turf	<u>100</u>	<u>210</u>	<u>2</u>
TOTAL	4400	9240	100

During 1983 it is estimated that a total of approximately 4,400 canoes were launched within the study area.

1/ Number of visitors equal number of canoes x 2.1 (average number of people per canoe for the Manistee National Forest).

16. Forecasting Future Watercraft use for the White River

General Assumptions About the Future

General assumptions provide a view of the future that is used by the Forest Service in its planning efforts. Whether national trends or regression estimates on forest-specific data are used, the general assumptions provide the basis for future use.

In making the general assumptions used here, it is recognized that completely accurate predictions about long run population and economic growth, or any of the other determinants of demand for or supply of renewable resource products, are beyond attainment. The intent is to make assumptions, based on historical trends, current knowledge about developments which affect these trends, and present expectations about future changes which can be generally accepted as reasonable at this time.

An Assessment of the Forest and Range Land Situation in the United States (1980) is the source for most consumption projections for the Huron-Manistee National Forests. A brief review of the assumptions used in the Assessment is required to illuminate the resulting projections. As Nebel (1982) points out, the future will surprise us as it has in the past. However, some view of the future is needed in order to

prioritize government investments.

**Table 1.2 -- General Assumptions about the
American Public in terms of Population,
Gross National Product, Leisure Time, and Income 1/**

Subject	Assumption
Overall trends	Generally, the trends of the past 30 years will continue.
Population size	The annual rate of growth will continue to decline; however by 2030, the U.S. population will still be 37% higher than the 1978 level of 218.5 million.
Population age	The average age of the population will increase; middle age classes with the highest income levels and largest demands will increase.
Labor force	Increasing female participants will keep the labor force growing at current rates through 2010.
Hours worked	Slow decline in hours worked, per year will continue leading to more leisure time.
Gross national Product (GNP)	Continued growth is assumed; GNP in 2030 will be 4 times greater than the 1977 GNP.
Disposable personal income (DPI)	Continued growth is assumed; DPI in 2030 will be 3 times greater than the 1977 DPI.
Institutional and technological changes	Historical data incorporates change; projections inherently account for change.
Energy costs	Substantial and persistent upward price movement is expected.
Capital availability	Capital availability will not constrain long-term economic growth.

1/ Taken from An Assessment of the Forest and Range Land Situation in the United States (1980) pp. 8-21.

In reviewing these assumptions, it is evident that continued growth is assumed and will lead to increasing demands for the nation's resources. (RPA 1980)

National Projection of Canoe Demand

Projected participation levels based on the assumed increases in population, economic activity, and income used in this study are shown in table 1.3. In general, participation for water activities is projected to increase fairly rapidly, with sailing and canoeing showing large growth. It is anticipated that water activities, as a group, will increase 106 percent by 2030. Water activities attract a broad cross-section of the population, although regional differences in participation do exist for some activities. People living in the North are more likely to participate in canoeing and sailing, while those located in the South, Pacific Coast, and Rocky Mountain and Great Plains States are more frequent participants in motor boating and water skiing. (RPA 1980).

Table 1.3 -- Indexes of Demand
for Canoeing in the Contiguous
States, 1977 with Projections to 2030 1/
(1977=100)

Type of Activity	Projection Level 2/	PROJECTIONS					
		1977	1990	2000	2010	2020	2030
Canoeing	High	100	140	182	243	305	384
	Medium	100	121	140	170	200	233
	Low	100	109	117	128	141	155

1/ An Assessment of the Forest and Range Land Situation in the U.S. 1980 pp. 101.

2/ Projected levels are keyed to the projections of population, economic activity, and income.

Projection of Watercraft demand for the White River

1983 watercraft use for the White River (Table 1.1) was approximately 4,400 canoes. This figure when combined with the RPA projection figures used in Table 1.3, will yield projected watercraft user demand for the White River from 1983 to 2030.

Table 1.4 -- Demand for Canoeing on the White River

Type of Activity	Projection Level	1983	1990	2000	2010	2020	2030
Canoeing	High	4400	6160	8008	10692	13420	16896
	Medium	4400	5324	6160	6480	8800	10252
	Low	4400	4796	5148	5632	6204	6820

Table 1.4 indicates that by the year 2030 canoeing (or any type of watercraft) use is projected to increase $1\frac{1}{2}$ times present use at the low level, $2\frac{1}{3}$ times at the medium level and over $3\frac{3}{4}$ times at the high level.

Growth on the White River Expected to be Slow

The growth rate for canoe use on the White River during the period 1980-1983 averaged approximately negative five percent (-5%). This negative growth rate was directly attributable to the 1980-1982 economic recession. The state of Michigan and its citizens suffered immeasurably during this time. High unemployment caused many people to dramatically reduce their recreation activities. The economic recovery in Michigan is predicted to be slower than in many other parts of the country and will affect the recreation industry longer. Full recovery is not likely until 1990.

C. SIGNIFICANCE

The White River, within the White Cloud Ranger District, Huron-Manistee National Forests, is an average river. It has no special national classification although the State of Michigan has designated the White and its tributaries a "Country Scenic River". It has also been inventoried by the Forest Service as having the potential to become a semi-primitive motorized area. Present recreation use on the River is light to moderate and its scenic quality and value for watercraft recreation can be termed common. No known conflicts exist between river recreationists and other users of the river such as homeowners, fishermen or other canoeists or between users and the natural environment along the river.

Given the above apparent tranquil conditions why then is there concern about adding another watercraft livery permit? Why undertake a study of the White River now? Why not wait 10 years, 20 years or 50 years to determine if management changes are needed?

The answer to these questions lie in what river recreation is expected to do in the future. Predictions by nearly every well known river "expert" in America is that, "Within the foreseeable future there will be substantial increases in river recreation". Some predictions indicate a doubling

of current use. Indicators such as increasing population, disposable income, and increased interest in physical exercise all point to substantial long range increases in all types of water related activities (1980 RPA). The rivers that will show the greatest increases in the future will be the ones located nearest large population centers in the Midwest, East and far West. (Leatherberry, Lime, Thompson 1980).

These predictions indicate that, some time within 10-20 years over-use will occur even on many of the average rivers of the nation. We have discovered, almost belatedly, that many of our streams are running on borrowed time. There has been an accelerated demand on our rivers by industries, utilities and people in general. Our previously "undiscovered" river resources are being rapidly developed. (Priesnitz 1975)

Effects of Over-use

Over-use is the most serious problem facing river recreation management in the East (Criley & Allison 1970). Over-use implies unpleasant user experience as well as degradation of the natural resource, which adversely affects plants, animals, and soils along rivers. Erosion of the stream banks, campsites, and landings is a common problem. Growing use may also result in more littering and vandalism to private property along waterways.

Problems of maintenance and law enforcement increase. There is often friction between riverside landowners and recreationists who trespass, vandalize, litter, and make noise.

Growing recreation use of rivers throughout the United States has created problems that require new knowledge, innovative planning, and new management tools for use by resource administrators. This is true not only for rivers in primitive environments, such as those traversing designated Wilderness Areas, but also for rivers in multiple ownerships and with multiple uses, especially in densely populated sections of the country, farming regions, and other locations where recreation co-exists with other uses. All these factors suggest a need for new and more comprehensive policy direction and creative solutions that are compatible with current conditions and philosophies (Lime, 1982).

The White River is a Valuable Resource

Every river is a valuable natural resource with a variety of potentials and should be dedicated to the uses for which it is best suited (Lewis, 1977). Despite its common qualities the White River is a valuable, and limited natural resource and should be managed for moderate watercraft use and other types of broad spectrum recreational opportunities.

Once use is established it is difficult for public agencies to implement controls. The Forest Service as a resource manage-

ment agency cannot allow over-use to develop on the White River. The Forest Service must get ahead of this predicted demand and develop plans which will protect the resource and at the same time give the river user a quality experience. Failure to make this decision or even to delay it, could mean degradation of this resource some time in the future.

D. Statement of the Problem

This study will determine if watercraft controls on a 25 mile segment of the White River will be needed in the future.

An optimum carrying capacity for watercraft within the study area will be developed using a combination of social, physical and management elements. If the optimum carrying capacity is properly developed and applied to the study area the natural qualities of the environment will be maintained and still provide a desired experience for the recreation user.

The optimum carrying capacity will be compared against current and projected use for the study area. If use exceeds the optimum carrying capacity the present outfitter guide application and any future ones that are received will be rejected. If use remains at or below the optimum carrying capacity the application will be recommended to the Forest Supervisor for approval.

E. Hypotheses

There will be continued growth in demand for river recreation. Popularity of the smaller rivers, like the White, will increase because of crowding on the larger more popular rivers. Even if alternate rivers are developed and watercraft distributed more evenly, some time in the future it is predicted that the number of watercraft on the White River will exceed carrying capacity and will have to be limited to protect the quality of the resource and recreation experience.

F. Delimitations

This paper is not intended to be a comprehensive management plan for the White River. The recommendations are directed toward establishing an optimum carrying capacity for watercraft within a 25 mile section of the White River located between the village of Hesperia and Fruitvale Road bridge.

G. Definitions

Carrying Capacity - The amount of recreation use most appropriate for both the protection of the resource and the satisfaction of the participant.

Experience Level - The perceived reality of the situation compared to a person's own expectations.

ORRRC - Outdoor Recreation Resources Review Commission.

Optimum - The best or most favorable degree, quantity, number, etc. Most favorable or conducive to a given end.

Optimum Recreation Carrying Capacity - The amount of recreation use of a recreation resource which reflects the level of use most appropriate for both the protection of the resource and the satisfaction of the participant.

Physical Recreation Resource Carrying Capacity - The level of use which a recreation resource can support without causing an unacceptable change in the recreation environment; a level of use beyond which the resource cannot restore itself by natural means.

ROS - Recreation Opportunity Spectrum - is a framework for defining the types of outdoor recreation opportunities the public might desire, and identifies that portion of the spectrum a given National Forest might be able to provide.

Recreation - Recreation shall include a wide range of outdoor activities intended to provide refreshment of strength and spirits.

Recreation Resource - Land and water areas, with associated facilities, which exhibit qualities which make them particularly suitable for use as an area for outdoor recreation activities.

River Recreationists - People who travel on rivers or streams in motorized or non-motorized watercraft.

Social Recreational Carrying Capacity - The point beyond which the number of participants begins to diminish the recreational experience of the other participants; the capacity most appropriate for participant satisfaction.

Watercraft - Rafts, canoes, kayaks, innertubes or other non-motorized water transportation.

H. Limitations

Lack of time and resources prevented detailed gathering of satisfaction and preference data from watercraft users of the White River. All use and user information referred to in this study originated from Forest Service RIM records; conversations with livery operators and managers of organizational camps, such as the Boy Scouts of America; and local Forest Service knowledge and experience.

The majority of contemporary river research and management information was written in the 1970's before the 1980 economic recession. The State of Michigan and its citizens suffered immeasurably during this time. High unemployment caused many people to dramatically reduce their recreation activities. As an example, canoe use on the White River declined an average of 5% per year during 1980 to 1983. The economic recovery in Michigan is predicted to be slower than in many other parts of the country and will affect the recreation industry longer. As a result of this impact the projected user demand referred to in this report will be lower than in many other areas of the nation. Full recovery is not likely until 1990.

Reference is made to potential Semi-primitive Motorized, Recreation Opportunity Spectrum classification for the study portion of the White River and adjacent lands. This classification is presently in its earliest stages of development.

within the Forest Service's Land Management Planning Process. It is anticipated that it will be accepted as described in this project but at the present time has not had public input or been approved by the Forest Supervisor of the Huron-Manistee National Forest or the Regional Forester. The optimum carrying capacity will be analyzed and selected under the assumption that the management objectives for the river will be semi-primitive motorized.

CHAPTER II

Literature Review

LITERATURE REVIEW

A general literature search and review was conducted in order to capture pertinent information available about the many subjects directly related to River Recreation Management and Carrying Capacity.

A. Some of the more important material referred to in this report can be found in the six documents listed below:

1. Proceedings: River Recreation Management and Research Symposium - this document is the most definitive state-of-the knowledge currently (1977) available concerning river recreation activity. This report contains over 50 management and research articles by knowledgeable river managers and researchers.
2. The Naturalist: River Recreation - Journal of the Natural History Society of Minnesota (1975).
3. Renewable Resources Recreation in the United States: Supply, demand, and critical policy issued by Cordell & Hendee (1980).
4. Outdoor Recreation for America: An Assessment Twenty Years After the Report of the Outdoor Recreation Resources Review Commission (1983).
5. An Assessment of the Forest and Range Land Situation in the United States - Forest Service (Resources Planning Act of 1974) 1980.
6. A Recommended Renewable Resources Program - 1980 Update Forest Service (Resources Planning Act of 1974).

B. A number of established River Management plans were reviewed to determine if their management concepts and recommendations would apply to the White River; they include:

1. Pere Marquette National Scenic River Management Plan - Manistee National Forest 1982.
2. A Canoe Use Allocation System for the Pere Marquette River Gebhardt 1983.
3. Pine River Canoe Use Regulation - Manistee National Forest 1977.
4. Chattooga River: Recommended Management Objectives; Maximum Use
5. Limits and Rationing Techniques - Wallace 1983.
6. Natural River Plan: White River - White River Planning Group cooperating with the Department of Natural Resources (1975).
7. Huron-Manistee National Forests Watershed Management Report for the White River 1982.

C. In order to determine management objectives, policies and long range direction for the White River, the following documents were referenced:

1. Regional Land Management Plan 1983
2. Forest Land Management Plan 1983 (Draft)
3. Management Goals - Huron-Manistee National Forest (Draft) 1983
4. Recreation Opportunity Spectrum - U.S. Forest Service.

D. Dozens of individual management reports and research papers were referenced in this paper. Some of the more frequently used, by general topic heading include the following:

1. Carrying Capacity and Experience Levels

Guidelines for Understanding and Determining Optimum

Recreation Carrying Capacity - Urban Research Development for the Bureau of Outdoor Recreation U.S.D.I. This document provided key information in developing the three carrying capacities for the study area. The information displayed here has a very large data base backing up recommendations and it allows managers latitude in determining carrying capacity due to important factors related to the study area.

North Country Trail Management Plan U.S. Park Service 1982
Lime 1979

Lenci & Stankey 1971

Ohmabn 1973

Roggenbuck & Schreyer 1975

Heberlein

2. River Use:

Most use predictions originated in the mid to late 70's and were reinforced by the Forest Service RPA documents in the 80's

Projections of Future Forest Recreation Use - Forest Service 1983

Lime 1975, 1979, 1981

Hansen 1975

NASH

Doehne 1975

Craig

3. User Satisfaction, Motives Preferences and Conflicts

Driver and Bassett 1975

Solomon & Hansen 1972

Dawson, Decker, Lime & Knopf 1981

Roggenbuch, Smith & Wellman 1982

Knopp, Ballrman & Merriam Jr. 1979

LaPage 1981

Knopf, Peterson & Leatherberry

Lewis & Marsh

Criloy & Allison

4. Watercraft Allocation and Reservation System

Schomaker & Leatherberry 1983

Warren

5. Impacts to Soil and Water

Settergren 1975

Hansen 1975

Cleveland 1983

Solomon 1983

6. Management and Planning

Yearout, Seaman & Lee 1975

Brown 1975

Lime 1975

Small bits and pieces of information extracted from the publications referenced above, combined with personal experience and knowledge of the White River and its recreation users, interviews with organizations and liveries currently using the river are all sandwiched together to form a recommended

watercraft management plan for 25 miles of the White River.

Knowledge gained through reading about carrying capacity, social and economic impacts, user experiences and preferences and constraints by managing agencies had a large part to play in constructing this paper.

CHAPTER III

Procedures

A. Statement of Method

This study will establish an optimum carrying capacity for watercraft on the White River. There is no carrying capacity for the study area at the present time. The White Cloud Ranger District received an application from an individual desiring to use National Forest land to launch as many as 300 innertubes each weekend day within this study area. Should the Forest Service allow the permit and if so for the entire 300 innertubes? or a portion thereof? How many watercraft permits should be allowed in the future.

In order to adequately address these questions for the study area this paper will:

1. Display current management objectives.
2. Define and calculate the social carrying capacity, the physical carrying capacity and the management carrying capacity.
3. Compare the three calculated carrying capacities with each other, the established management objectives for the study area and with established carrying capacities currently being used on the Pine and Pere Marquette rivers.
4. Project current watercraft use on the White River to the year 2030 using 1980 RPA canoe demand projections.
5. Make a recommendation to approve or disapprove the outfitter guide application, based on the developed optimum carrying capacity and projected future use.

B. Compile Management Objectives for the Study Area

A list of known management objectives (constraints) for the study area will be compiled and displayed. Management objectives form a parameter within which carrying capacities can be described. Forest Service National, Regional, and Forest Land Management Plans, the Recreation Opportunity Spectrum as well as goals and objectives from "an assessment of the Forest and Range Land Situation in the United States", will be referred to.

Because the White River is a state designated "Country Scenic River" the Natural River Plan written by the White River Planning Group, will be referred to for additional Management constraints.

C. Define and Calculate the Social Carrying Capacity for the Study Area.

Social Carrying Capacity - is the number of visitors that can be put into an area before the quality of their experience is significantly reduced. Social carrying capacity is supported by evaluation 1) who is using the river 2) in what numbers, and 3) what experience do they anticipate and desire.

Current research information and existing river management plans will be applied to the study area to determine the current social carrying capacity. The social carrying capacity

will be displayed as the number of watercraft/mile of river.

D. Establish Physical Carrying Capacity for the Study area

Physical carrying capacity is the amount of recreation use that an area can support without serious damage to the resource or to the experience of the visitor. Evaluations of the water, soil and vegetation will be presented to determine if one or more will limit the physical carrying capacity of the river. The physical carrying capacity will be displayed as the number of watercraft/mile of river.

E. Establish a Management Carrying Capacity for the Study area

The Forest Service has as a goal to provide a broad range of recreation experiences to the public. Some experiences are in short supply and in great demand. Wilderness is one example, wild and scenic rivers are another. The study area has been classified as a potential semi-primitive motorized (SPM) management area. The Recreation Opportunity Spectrum will be used with other established management objectives to construct a carrying capacity based on providing and maintaining a SPM experience level. The ROS Guide as well as other significant research information will be applied to the study area to define a recommended management carrying capacity displayed as number of watercraft/mile.

F. Comparison of the Three Carrying Capacities and Selecting the Optimum One

Here the three carrying capacities developed above will be compared and tested against 1) each other, 2) the Pine and Pere Marquette rivers and 3) management objectives. The carrying capacity which rates the best in meeting the objectives for the study area will be selected as the optimum one.

G. Recommendation Concerning the Outfitter-Guide permit

This section will use the selected optimum carrying capacity and the current and projected watercraft demand as parameters to determine if at any time up to 2030 the carrying capacity will be exceeded.

The outfitter-guide permit will be recommended for approval if the projected demand figure stays below the optimum carrying capacity. The permit will be rejected or amended if the projected demand exceeds the optimum carrying capacity.

CHAPTER IV

Analysis of Data

A. Introduction

Recreation management decisions can be approached using carrying capacity. It fits the purpose because carrying capacity is an integrating concept and it can be communicated fairly easily. It is, however, difficult to calculate. When actual calculations can be made carrying capacity produces a number which is a standard indicating the maximum amount of use to be achieved. This number becomes one of the many inputs to selecting management levels - one that may limit the range of alternatives considered (Brown 1977).

River managers must seek out an optimum level of use which will allow as many persons as possible to float a river, without destroying the very values for which the area was established and is being managed.

Optimum Carrying Capacity

Defining this optimum level is done by establishing an optimum carrying capacity. Carrying capacity is defined as:

The character of use that can be supported
over a specified time by an area developed
at a certain level without causing excessive
damage to either the physical environment
or the experience for the visitor.

Thus carrying capacity is a multidimensional and dynamic concept capable of manipulation by the manager consistent with

administrative, budgetary, and resource constraints (Lime & Stankey, 1971).

There are many possible capacities for a given recreation area and determining that capacity requires a consideration of the values of a variety of publics and the area's resource resistance to recreational use. Just as the sheep farmer, cattle rancher, and gamekeeper need to know the stock carrying capacity of their lands, managers of recreational land must know what the results of varying intensities of recreational use will be (Ohmann 1973).

Recreational carrying capacity is not a simple, single, absolute value. There is no fixed figure we can point to for a particular recreation area and say "this is the carrying capacity". The recreation manager is faced with a complex set of conditions. He must consider a wide range of activities, many of which are in conflict with one another. He must also provide for many different kinds of users; old, young, active, passive, etc. And he must provide opportunities for a wide range of values, many of which are incompatible with one another. Carrying capacity as difficult as it is to calculate does serve as an important starting point for considering and managing use and potential overuse of the river. (Lime & Stankey 1971).

Once established, the carrying capacity must be incorporated into a management plan for the river to control use at, or below, that capacity so managers can assure preservation of the resource and a quality recreation experience for the user (Eastman, 1977).

Establishing Carrying Capacity

There are two basic state of the art carrying capacities:

1) social carrying capacity and 2) physical carrying capacity. The Forest Service in developing the long range Land Management Planning Process used another kind of carrying capacity called Recreation Opportunity Spectrum. Its principle component is the experience level. For the purposes of this study it will be referred to as the 3) Management Carrying Capacity.

A very important component in establishing recreation carrying capacity for an area is management objectives. Management objectives set the parameters for determining carrying capacity and will be discussed in detail below.

The three types of carrying capacities noted above will be defined, discussed and calculated for the study area. One of these or a combination of one or more will be selected as the optimum carrying capacity for the study area. The optimum carrying capacity will be compared to the other two carrying capacities through the use of a "comparison matrix".

The matrix will compare the three carrying capacities to see which one(s) best meet the management objectives.

Because the management carrying capacity uses established management objectives including the Recreation Opportunity Spectrum as its main parameter the writer must concede that this carrying capacity will more than likely be the one that meets all or most of the management objectives for the study area.

However it is important to note that it is necessary and important to develop carrying capacities for the other two. It is important to this study because the figures calculated for social carrying capacity and physical carrying capacity will be used to compare against the management carrying capacity. The management carrying capacity for watercraft should be substantially smaller for the White River than either the social or physical capacity.

B. Management Objectives

Carrying capacity for an area can be evaluated only within the context of management objectives which specify the kind of recreational opportunities the manager is to provide. Carrying capacity is not a fixed, absolute value inherent in every area. If management objectives for an area change, the carrying capacity will change also (Lime, and Stankey, 1971; Wagar, 1964).

Management objectives are important factors in establishing a carrying capacity because it describes just how the managing agency, perceives the limits to be placed on the resource and its use.

Management objectives define, as specifically as possible, the kind of recreational opportunity or opportunities the area is to provide. They should be realistic and attainable (Lime, 1979).

Management Objectives for the Study Area

General

- * Provide high amounts of dispersed recreational activities.
- * Promote participation in water activities
- * Maintain water quality and protect riparian areas.
- * Control recreation visitor access and use in order to assure protection of water quality and river environments and high quality recreation experience.

- * Management activities adjacent to lakes, streams, and wetlands will be designated to maintain streambank and shoreline stability.
- * Encourage private investments in outdoor recreation on National Forest Lands (RPA 1980).

Management objectives that apply to semi-primitive motorized areas:

Area management will conform to the appropriate Recreation Opportunity Spectrum (ROS) Class (see Appendix B)

This includes:

- * Concentration of users is low to moderate
- * Controls present but subtle
- * Moderate probability of experiencing isolation
- * Opportunity to have a high degree of interaction with natural environment
- * Natural setting
- * Structures are rare and isolated

Management Objectives that apply to the State designated Country Scenic River

Because the White River is designated as a State Country Scenic River, management objectives must include the ones set down by the Natural River Plan for the White River (White River Planning Group, 1975). The Forest Service should comply with these objectives whenever possible.

They are:

- * Maintain high water quality

- * Protect the natural character of the river and the natural flow of its waters.
- * No solid waste disposal within sight of the river.
- * Maintain a natural vegetation strip 100' or more in width.
- * On public lands, no new campgrounds within 300' of the river.
- * Emphasis will be given to maintaining a high quality fishery and quality fishing experience.
- * New public roads, highways and river crossings will not be permitted.

C. The Social Carrying Capacity for the White River

Social carrying capacity is defined as: the visitor density level that can be tolerated before an area becomes too crowded and no longer gives a satisfactory recreation experience.

Social carrying capacity is difficult, and sometimes impossible to determine. This task is formidable because the determination of satisfaction relies upon a person's judgement of how he perceives a particular experience; we must rely on these value judgements which cannot be precisely evaluated or measured. The fact that each person has different tolerance levels to crowding makes it even more difficult to determine a precise social carrying capacity.

Social and recreational carrying capacity is a human concept. Therefore an understanding of human behavior is critical to dealing with any kind of a capacity issue (Schreyer 1976). Determination of social carrying capacity requires recreation planners and managers to know how and by whom riverscapes are used and the perceptions a user has of the area. In a sense, basic descriptive information is analogous to timber and range inventories. In both instances the data allows analysis of supply and demand relations (Lime, 1979).

1. Who is using the river

The question of who is using the White River can best be

described by the following profile of the typical person floating the White River:

Origins

- * 80% come from within 100 miles of the White River
- * Most are between the ages of 15 and 25
- * Most come from urban rather than rural communities
- * Only 1% are minority
- * Only 1-2% camp one night on the river
- * 50% are repeat users, 50% are first timers on the river

Group size

- * 50% come with a group of 10-30 people
- * 40% come with a group of 4-8 people
- * 10% come as couples or individual families

Type of craft used

- * 95% use canoes of which 70-80% are rented
- * 5% use innertubes

Trip preference

- * Most want to float from mid June to the end of August
- * 75% want to float on weekends
- * 50% prefer Saturday
- * 25% prefer Sunday
- * 25% float during Monday-Friday
- * Most prefer to spend 2-4 hours on the river
- * Favorite float is 2½ hours in length

Skill level

- * 75% are novices
- * 25% are somewhat experienced

2. User perception of the study area

How a person perceives a particular situation provides the primary basis for determining what he considers to be the social carrying capacity for the particular situation. Many considerations shape our feelings and perceptions. The process of human perception helps explain why these perceptions vary widely between people; elements of the basic human perception process include how we receive information from a social and physical environment, how we interpret this information based upon our experience and attitudes, and how we react to a particular environment (Schreyer 1976).

User Perceptions of the White River

Positive: They like the undeveloped shoreline
They like the availability of short float trips
They like the easy availability of rental
canoes
They come because the river is close to their
homes

Negative: The river is shallow and slow moving
Put-in points too steep
Don't like litter

Conflicts with others: In general floaters using the White River have very little or no conflict with landowners, fishermen or other floaters (appendix C). The converse is also true; no known conflicts presently exist between landowners, fishermen, and floaters.

The Average Floater Profile

Most people who engage in floating as a form of recreation pretty well fit into the "average floater" profile regardless

of the type of river setting used. Friendship, escape, exercise and learning seem to be the most important motives used to explain the reasons they float rivers (Knopf, Peterson, Leatherberry, 1983). The information compiled for the typical White River floater tends to reinforce this profile. It is logical to state that the motives used by the average floater cited in the literature above are the same for the White River floater. Therefore the average White River floater can be categorized as:

- * A "social canoeist" rather than a primitive one. This term is defined as "one that enjoys the camaraderie and sometimes the shenanigans of others and him/herself in canoeing and may engage in the activity primarily for those purposes or at least find these aspects a great part of his enjoyment" (Unknown).
- * School and college age young people would most often represent this group, but families and other groups would also at times fall into this category. (DNR State of Michigan River Rules 1972).

- * Their perception of carrying capacity will be very high numbers of users as compared to users desiring a more primitive experience.
- * The number of floaters presently using the White River are not causing dissatisfaction among users.
- * The large majority of floaters using the study area are satisfied with the stream and their experience. If they are satisfied then the social carrying capacity has been established at that use level. Maximum social carrying capacity may be much higher than present use indicates.

Observations About Social Carrying Capacity

- * There is a great amount of elasticity in defining the number of people an area can sustain on a social basis.
- * Social capacity is the capacity most appropriate for participant satisfaction.
- * Managing for user satisfaction implies extremely high density levels. This is probably inconsistent with the kind of experience most recreational managers are expected to provide and is certainly inconsistent with what is normally defined as semi-primitive recreation (Nielsen & Shelby 1977).
- * User attitudes and preferences are likely to be developed during the recreation experience, and people tend to endorse the kind of experience they have.
- * Social carrying capacity is extremely difficult to define and may not fit in with all established management objectives for the river.

3. Calculation of Social Carrying Capacity for the White River

The floater profile, current research recommendations, and existing management plans for similar rivers were put together to select the social carrying capacity for the study area.

Table 4.1 -- Social Capacities Recommended by State and Federal Agencies

<u>Agency</u>	<u>Recommended Social Carrying Capacity (Crafts/mile)</u>
Michigan Outdoor Recreation Plan of 1967 - for the AuSable, Pere Marquette Pine and Manistee	10
Bureau of Outdoor Recreation USDI. Optimum recreation carrying capacity 1977 (appendix D)	6 <u>1/</u>
USDA Forest Service - Pere Marquette National Scenic River Management Plan 1982	6-7
Comprehensive Plan for Wisconsin, Outdoor Recreation - 1966	4
Calculation of acreage needs and requirements, Bureau of Outdoor Recreation USDI. Great Lakes Framework Study 1975	2

1/ This is a base figure for the typical or average river.

The Recommendation

The White River is an average river with average floating qualities. The users tend to be persons desiring a more social than primitive experience. The users experience is not reduced due to moderate to high numbers of people. The users of the White River can be closely compared to the ones using the Pere Marquette River. The White River fits the

description of an average or typical river as indicated by the 1977 BOR Study (appendix D). The recommendation of this study is that the social capacity for the White River be established at 6-7 canoes/mile.

D. Physical Carrying Capacity for Watercraft on the White River

The concept of physical carrying capacity involves the level of activity that an area can support without causing an unacceptable change in the recreation environment. An area's physical capacity is reached when further use will impact the site beyond it's ability to restore itself by natural means.

A good definition of physical carrying capacity is:

"the amount and character of use an area can sustain over a specified time period without causing unacceptable change to the physical resource" (Lime, 1976).

Determining "physical carrying capacity" is difficult and, as with social capacity, no magic number exists. The physical capacities for each activity are as different as the physical settings in which they are located. For example, a pine forest can withstand less intensive camping than can a prepared hard surface camping area. This variability is compounded by the fact that changes in climate, like an extremely dry summer, can greatly alter the physical carrying capacity of a site.

1. Physical Features within the Study Area

In order to calculate physical carrying capacity it is necessary to have information on the physical features of the area which determine its physical structure. These physical features can be identified as follows: 1) geology and soils, b) topography and aspect, c) vegetation, d) climate, e) water, and f) flora and fauna. These factors all play an important role in determining the ability of a site to withstand recreation pressure (Chubb and Ashton 1969).

Detailed examination of each environmental, ecological and biological feature of physical capacity is beyond the scope of this study. The most important factors influencing a site's physical capacity are soil, water and vegetation. These features and their relationship to the study area will be discussed in detail.

SOIL

The most common recreational impacts on the soil include the following: (Settergren, 1977)

- * Surface compaction and bulk density increased. The finer-textured soils displayed the greatest degree of compaction. Sutton, working along the Current River in Missouri, noted that it was virtually impossible to alter the density and structure of the gravel and sandbar soils at stop-over points along the river frequently used by floaters. He further observed that, with the possible exception of occasional mechanical injury done to the young willow vegetation by visitors, these sites appeared to be indestructible. The greatest degree of soil compaction occurs immediately following the opening of a new area. Thereafter, surface soil density stabilizes.
- * With surface soil compaction and the reduction in protective ground cover vegetation, sheet erosion, soil profile truncation, and root exposure often result.
- * Infiltration and hydraulic conductivity are reduced.
- * Soil organic matter is reduced.
- * Because of the effect of compaction on infiltration and soil storage, soil moisture content and availability may be seasonally low.

Soil Capability at Major Access Points within the Study Area

There is an absence of intensive and prolonged watercraft-related activity such as camping, hiking and climbing along stream banks within the study area. This very favorable situation eliminates the need to address soil damage to these areas.

Nearly all the negative soil impacts caused by watercraft use on the White River are concentrated at river access points. A soils evaluation was completed for each of the present and potential access points within the study area by the Huron-Manistee National Forest Soils Scientist, Dave Cleland (Table 4.2). The purpose of the soil evaluation was to evaluate each soil for negative changes in major soil characteristics as described above. This evaluation describes the soils found at each access point and their projected recreation capability (see appendix E). The criteria used to evaluate the soils found at each access point and the recreation use rating for each are found in table 4.3.

Two access points, Twin Rollaway and Podunk, show that the soil dependent carrying capacity has been exceeded. Twin Rollaway, because of soil gradient and slope length and Podunk, because of drainage class and soil texture. This indicates that site hardening must be undertaken to improve the soil capability if sustained recreation use is to be continued.

TABLE 4.2

Soils capability for sustaining current and projected recreation use
at 7 access points on the White River

Location	Soil	Slope	Drainage	Soil	Present	Sum	+25-50% over cur.	-25-50% under
	Gradient	Length	Class	Texture	Conditions		use levels	use levels
1. Pines Point								
Canoe Launch	4	4	4	4	4	20 ^{1/}	20	20
Vehicle Access	2	2	3	4	4	15	15	15
2. Podunk								
Canoe Launch	4	4	0	0	4	12	8	12
Vehicle Access	2	2	2	3	2	10	10	11
3. Kneff Lake								
Canoe Launch	4	4	2	4	4	14	12	14
Vehicle Access	2	2	4	4	2	12	12	12
4. Sischo								
Canoe Launch	4	4	4	4	4	20	20	20
Vehicle Access	4	4	4	4	4	20	20	20
5. North Branch								
Canoe Launch	NA	NA	NA	NA	NA	NA	NA	NA
Vehicle Access	4	4	4	4	4	20	20	20
6. Twin Rollaway								
Canoe Launch	-4	-2	4	4	0	2	0	0
Vehicle Access	-4	-4	4	4	2	22	22	22
7. Skeels								
Canoe Launch	NA	NA	NA	NA	NA	NA	NA	NA
Vehicle Access	2	2	4	4	4	16	16	16

^{1/} Capability ratings of less than 10 indicate the soil dependent carrying capacity for that use (i.e., canoe launch verses vehicle access) has been exceeded, resulting in adverse impacts in the soil resource relative to vegetative response and/or water quality. For locations and uses with ratings lower than 10, mitigation measures should be implemented or use levels reduced. (Cleland, 1983)

TABLE 4.3

Capability Criteria for Rating Soil Capability

	<u>Launching Area points</u>	<u>Access Route points</u>
<u>Slope gradient</u>		
0-6%	4	4
6-12%	2	2
12-18%	0	0
18-30%	-2	-1
30% +	-4	-2
<u>Slope length</u>		
0-10 ft.	4	4
10-50 ft.	2	2
50-100 ft.	0	0
100 ft. +	-2	-2
<u>Drainage class</u>		
Very poorly drained	0	-2
poorly drained	2	0
moderately well drained	4	4
well drained	4	3
<u>Soil texture</u>		
sandy	3	4
loamy	4	4
silt loam	4	2
organic	0	0
<u>Present condition</u>		
non-eroded	4	4
1-10% eroded	2	2
10% eroded	0	0

Water

Water quality of streams is a dynamic system that is undergoing either gradual or rapid change depending upon a large variety of environmental influences. Water quality changes due to flow, diurnal effects, seasonal changes, weather influences, mixing of surface waters and a variety of other subtle effects.

Stream Water Quality Index for the White River

The current concept of a water quality index (WQI) was initially proposed by Brown (1970). A WQI was developed by a panel of 142 people with sanitary engineering interests. The group developed a list of nine parameters they felt were most important, weighted the parameters and drew parameter quality function curves. A primary objective of that index was to measure water quality improvements from pollution control programs. The WQI reported by Brown was designed primarily for urban impairment problems and contained parameters that are not relevant to National Forest conditions and uses.

The R9 WQI was developed in a similar fashion to those of Brown (1970) and Dunnette (1979). Water resource and fishery specialists of the Eastern Region and Northeastern Stations were asked to list the parameters (appendix F), weight them, and draw quality function curves. The R9 index differs from other WQI in parameters, weights, curves, and concepts. As suggested by Stoner (1975), the R9 index is more of a use

oriented index (Huron-Manistee Watershed Report, 1983).

The highest rankings are for waters which are in the optimum range for fishery and recreational uses. Waters with zero phosphate or alkalinity do not receive the highest rating.

Table 4.4 displays the stream water quality index (SWQI) for the four stations on the White River. Turbidity, pH, nitrate, phosphate and dissolved oxygen values generally contribute to the high values obtained for the White River. Alkalinity, fecal coliform, color and occasional nitrate and/or phosphate values are responsible for lower White River values. Dissolved oxygen rarely if ever gets below the value needed to maintain cold water fish (6.0 mg/l). Color tends to run higher than aesthetically desirable due to wetland drainage and iron staining.

The theoretical range of the index is 0 to 100, with 100 representing the highest quality water. The scale indicates that a score of 91-100 would rate excellent, a score of 0-25 would rate very bad.

TABLE 4.4

STREAM WATER QUALITY INDEX FOR THE WHITE RIVER 1/

<u>White Cloud</u>	<u>Hesperia</u>	<u>Pines Point</u>	<u>Fruitvale Road</u>	<u>Date</u>
96	100	95	90	2/27/78
94	94	94	94	4/17/78
92	89	90	92	10/4/78
95	91	90	87	11/28/78
97	95	98	82	1/10/79
96	92	92	85	4/25/79
94	94	94	95	9/18/79
96	95	95	97	12/10/79
96	98	98	95	3/10/80
92	88	90	86	5/5/80
97	86	95	85	9/9/80
98	95	97	95	1/5/81
94	92	93	91	9/23/82
95 <u>2/</u>	93	94	90	

1/ Huron-Manistee National Forests Watershed Management Report, 1983.

2/ The mean stream water quality index

The integration of these eight parameters in table 4.4 shows the water quality of the White River to be excellent at all locations except Fruitvale Road where the value dips to 90.

The information above describes water quality on the White River from 1978 to 1982. But what if watercraft use increases as predicted, will the river be able to maintain the same high water quality? In order to determine water quality on heavily used rivers we need to look at the water quality of the Pine River and Pere Marquette River. Both

of these rivers receive many times more watercraft use than does the White River. These rivers are located 25-40 miles from the White River and generally their soil, topography and other characteristics are similar to the White River. We find the following:

TABLE 4.5

STREAM WATER QUALITY INDEX
FOR THE PINE AND PERE MARQUETTE RIVERS 1/

<u>Pine River</u>	<u>Mean SWQI value from 1971 to 1982</u>
Stronach Dam	90
Daleson Bridge	92
Walker Bridge	91
Edgette Bridge	90
<u>Pere Marquette River</u>	
M-37	94
L.S.O. Bridge	92
Bowman Bridge	94
Upper Branch	93
South Branch	90

1/Huron-Manistee National Forest Watershed Management Report 1983.

Even with increased watercraft use, water quality remains excellent. It is also expected that as watercraft use increases on the White River water quality will remain high.

Vegetation

An outstanding direct impact caused by the river user has been vegetation trampling. In many areas multiple trails, all with the same ending and beginning place, are maintained simply through large numbers of people trampling the vegetation. This condition invites accelerated soil erosion and dramatically

changes the flora of these areas.

Vegetational Deterioration and Adjustment

The response of the native vegetation to concentrated recreational use may result from direct physical or mechanical injury or may reflect physiologic and morphologic adjustments made by the plants to soil compaction, lower soil moisture, etc. Among the more commonly reported observations are:

- * Mechanical injury to most trees on heavily used areas is common.
- * Total elimination of trees in the younger age classes.
- * A decline in tree vigor frequently signaled by "stanheading"
- * One of the first environmental indicators of heavy recreational impact is a reduction in the native ground cover both in amount and the number of species represented.
- * A number of investigators have observed that, following the first few seasons where the ground cover is reduced by recreation traffic to some low point, there is a recovery or adjustment in the vegetation (De Vos and Bailey 1970, Frissell and Duncan 1965, La Page 1967, Magill 1970, and Sutton).

Nearly every one of the 5 negative observations discussed above are evident at the main access points on the White River. Again, because of the absence of camping and hiking activity no negative impacts are occurring along the river banks at

the present time.

2. SUMMARY

Soil, Water, Vegetation

- * Following an initial change in the soil and vegetation, very little additional impact results with increased use (Frissel and Duncan 1965).
- * It appears that the passage of large numbers of canoes does not have any observable effect on streambank erosion (Hansen, 1975).
- * Only when canoeists stop and camp or walk on banks does erosion begin (Hansen 1975).
- * To minimize streambank erosion by canoeists management need not be overly concerned with density of canoe traffic. Rather, management should restrict streambank use by people (Hansen 1975).
- * Water quality in the rivers of West Michigan remain high despite high watercraft use.
- * Unrestricted recreational use will eventually lead to soil compaction; alternation in plant species composition; increased erosion, and dissatisfaction among visitors (Lime & Stankey 1971).
- * Studies do not attribute streambank erosion simply to canoe traffic on the riverways studied (Hansen, 1975). The erosion measured was usually linked to some nonfloating activity such as free vehicle access to the water edge.

- * Beardsley and Wager (1971) demonstrated that, with new areas, careful site selection and campground design coupled with reinforcement of heavy use areas can substantially reduce or eliminate deterioration of ground cover vegetation. They also found that, under certain conditions, watering, fertilizing, and seeding to durable species can effectively increase ground cover on recreation sites. (Beardsley & Wager 1971).
 - * The only limiting conditions in determining physical carrying capacity for the study area are soil and slope conditions at Podunk and Twin Rollaway. For purposes of this report canoe launching at Twin Rollaway and Podunk will be eliminated.
 - * All access sites on the White River were found to be standing up well to present use and are expected to do so under projected increases.
 - * Most of our larger streams can physically pass an extremely high number of canoes without significant damage if good entrance, exit and intermediate stops are provided. Social impacts of too many users will come into play far sooner than environmental impacts (appendix G).
3. Calculating the Physical Carrying Capacity for the Study Area
- The findings regarding conditions relating to soil, water and vegetation will not reduce the physical carrying capacity of the study area, except at the two access sites

rated poorly in the soils capability table (table 4.2). For purposes of calculating the physical carrying capacity watercraft launching at Twin Rollaways and Podunk will be eliminated

The physical carrying capacity for the study area will be equal to the total number of canoes each access site is physically capable of launching in one day.

Table 4.6 -- Canoe Launching Capacity at Access Points on the White River

<u>Access Points</u>	<u>Launching Capabilities per Hour</u>	<u># hours per day</u>	<u>Total canoes per day</u>
Hesperia	40	7	280
Taylor Bridge	40	6	240
Pines Point	25	3	75
Sischo Bayou	25	6	150
Twin Rollaway <u>1/</u>			
TOTAL CANOES/DAY			745

1/Eliminated due to soils.

The information above indicates that at physical capacity the study area has the potential to accomodate approximately 750 canoes per day each day during the recreation season and still be within the allowable physical carrying capacity limits. 750 canoes per day equates to a density of approx-

imately 12 canoes/mile for the study area. The Physical Carrying Capacity for the study area is 12 canoes/mile.

E. Management Carrying Capacity

The goal of maximizing user satisfaction for a given area can be met only if a spectrum of opportunities is provided that meets the diverse and often conflicting tastes of the public (Lime, Stankey, 1971). One goal the Forest Service has is to establish the approximate mix of the many kinds of recreational opportunities that might develop, and it is here that an understanding of what the recreationist seeks becomes invaluable to management decision-making. By making sure that a full range of opportunities exist, the Forest Service will be in a position to match visitor needs with opportunities rather than trying to develop recreation areas for the mythical average user (Shafer, 1969).

The primary factor in defining and developing a management carrying capacity is recreation opportunity. The study area has been inventoried and recommended by the Forest Service as an area that has the potential to provide the public with a semi-primitive motorized recreation opportunity. It is desirable therefore to develop a carrying capacity that will conform to and enhance the semi-primitive motorized character of the area. The Recreation Opportunity Spectrum and ROS Guide will be used to develop a carrying capacity for the study area which will be called the Management carrying capacity.

1. The Recreation Opportunity Spectrum

River runners and managers alike were alarmed by rapid increases in river use in Grand Canyon National Park (from 547 people in 1965 to 16,428 in 1972). The 1971 Draft Master Plan for the park indicates a concern for river management issues and suggested that river trips should provide a "wilderness experience". (Shelly, 1981) The River Use Plan issued in 1972 was an attempt to address the problem of uncontrolled use and to predetermine what a user experience should be. This is one of the first cases where experience played a major part in management direction for a resource.

What is ROS (experience level)

Stated simply, Recreation Opportunity Spectrum (ROS): is a framework that defines a series of linkages and relationships between recreational settings, activities, and experiences and how they are affected by managers and used by recreationists.

The assumption underlying the ROS is that quality is best assured through the provision of a diverse array of opportunities. The ROS recognizes that opportunities sought by recreationists range from easily accessible, highly developed areas with modern conveniences to undeveloped primitive areas in remote locations (wilderness). A wide variety of opportunities is possible between these extremes. (Clark, 1982).

The ROS provides a framework for defining the types of outdoor recreation opportunities the public might desire, and identifies that portion of the spectrum a given National Forest might be able to provide.

Major Components of ROS

While the goal of the recreationist is to obtain satisfying experiences, the goal of the recreation resource manager becomes one of providing the opportunities for obtaining these experiences. By managing the natural resource, settings, and the activities which occur within it, the manager is providing

the opportunities for recreation experiences to take place. Therefore, for both the manager and the recreationist, recreation opportunities can be expressed in terms of three principal components: the activities, the setting, and the experience.

For management and conceptual convenience possible mixes or combinations of activities, settings, and probably experience opportunities have been arranged along a spectrum, or continuum. This continuum is called the Recreation Opportunity Spectrum (ROS) and is divided into six classes (fig. 4.2).

Fig. 4.1 -- Recreation Opportunity Spectrum 1/

Primitive	Semi-Primitive Non-Motorized	Semi-Primitive Motorized	Roaded Natural	Rural	Urban
-----------	---------------------------------	-----------------------------	-------------------	-------	-------

1/ROS users guide

The six classes, or portions along the continuum, and the accompanying class names have been selected and conventionalized because of their descriptiveness and utility in Land and Resource Management Planning and other management applications. (ROS Guide)

Each class is defined in terms of its combination of activity, setting, and experience opportunities (Appendix B).

ROS Inventory for the Study Area

The land and water areas of the Forest are inventoried and

mapped by Recreation Opportunity Spectrum class to identify areas that are currently providing or have the potential to provide a broad range of recreation opportunities. This is done by analyzing the physical, social, and managerial setting components for each area. The characteristics of each of these three components of the setting affect the kind of experience the recreationist most probably realizes from using the area.

Planning for recreation opportunities using the Recreation Opportunity Spectrum is conducted by the Forest Service as part of Land and Resource Management Planning. Land and Resource Management Planning assures that National Forest System lands provide a variety of appropriate opportunities for outdoor recreation (FSM 2302.2). Each Forest need not provide an entire array of opportunities, but collectively the National Forest System will provide this variety. The appropriate roles of each Forest in providing opportunities should be established as part of the Land and Resource management Planning process, and be identified in the Forest, Regional and National Plans (ROS Guide).

The Land Management Planning process for the Huron-Manistee National Forest has been on-going for several years. The ROS mapping and inventoring portion of the planning process has been completed for the Forests. The White River study area has been inventoried as having the potential for providing Semi Primitive Motorized recreation

(see appendix A). The White River serves as the EAST boundary of the White River Semi-primitive Motorized Area (fig. 1.3). The Forest study which was used to nominate this area as SPM considered the White River as a strong factor in qualifying the area. It stands to reason that not only the land area but the adjoining river itself should be managed as SPM. The ROS classification is a Forest recommendation only, it is not final because the selection of the preferred alternative, public involvement or the Environmental Impact Statement portions of the Forest Land Management planning process have not been completed at the date of this report.

2. Calculating the Management Carrying Capacity for the White River

It is critical that current and potential users recognize, that although considerable research and management experience underlies the ROS, many judgements have been made in making it operational. The need for a timely and workable framework requires that judgements be made that combine research and management experience to define the state of the art. The result is a "best guess" tool for planning, management and research that will improve with experience if, and only if, the underlying assumptions, objectives and expectations, and documentation of its use are explicitly stated (Clark, 1982).

No carrying capacity figures exist at the present time for rivers on the Huron-Manistee N.F. (appendix H). It is a primary objective of this section of the study to establish a semi-primitive motorized capacity coefficient for the White River. Existing research, management objectives, general information, experience and logic are used to develop the management capacity figure.

Several studies will be used to establish and support a management carrying capacity for the study area. Most of the studies cited were used to establish a density relationship between ROS classes. They were not used for the purpose of extracting their numbers as a part of this study. The exception to this statement is the 1977 BOR Carrying Capacity Study. The writer believes that the information in this paper can be applied directly to the White River in determining management carrying capacity (appendix I).

Six references were used to determine management carrying capacity relationships. Each are displayed below:

1. Frequency of user encounters or density for various ROS classes

R-9

<u>ROS CLASS</u>	<u># OF CONTACTS</u>
Primitive	Less than 6 parties per day
Semiprimitive non-motorized	Usually 6-15 parties per day encountered
Semi-primitive Motorized	Low to moderate contact fre- quency
Roaded Natural	Frequency of contact is moderate to high
Rural	Frequency of contact is moderate to high
Urban	Large number of contacts.

2. Prescriptions: Uniform Forest Management Prescriptions,
Rocky Mountain Region, USDA - Forest Service. (1983) Capa-
city Ranges on Trails (PAOT/MILE For Riparian Areas)

<u>ROS Class</u>	<u>Very Low</u>	<u>Low</u>	<u>Moderate</u>	<u>High</u>
P-Wilderness	.5	.0	2.0	3.0
SPNM	2.0	3.0	9.0	11.0
SPM	2.0	3.0	9.0	11.0
RN	No Ranges Given			
R	"	"	"	

Guidelines for using the Rocky Mountain Capacity Ranges

- *Management requirements for dispersed recreation management in semi-primitive motorized recreational opportunity with a low to moderate incidence of contact with other groups and individuals.
- *Maximum use and capacity levels for trail use (PAOT/mile of trail) for riparian area management
- *The above capacity ranges may be reduced as necessary to reflect usable acres, patterns of use, and general attractiveness of the specific management type or where unacceptable changes to the biophysical resources will occur.
- *Trail and camp encounters during peak days, are less than 20 other parties per day for SP areas.

3. Capacity for Trails by ROS class

1981 Working papers Ken Eldredge Olympic National Forest

<u>ROS Class</u>	<u>Importance of solitude</u>	<u># of groups encountered per mile</u>	<u># of groups per mile</u>	<u># of people per mile</u>
P	Very Important	.375	0.75	3
SPNM	Important	.625	1.25	5
SPM	Mod. to low important	1.125	2.25	9
RN	Not important	2.125	4.25	17
R	Not important	4.125	8.75	33

4. Annex D Calculations of Acreage needs and requirements appendix 21 Outdoor Recreation, Great Lakes Basin Framework Study BOR-USDI (1975).

Table 21-48 standards for facility development for canoes:
4 visitors/mile or approximately 2 canoes per mile.

5. Michigan Outdoor Recreation Plan I-K 201 P. 4, 1967. Recommended the following carrying capacities/densities of canoes for various use levels.

INTENSIVE USE - 10 canoes/mile
MODERATE USE - 5 canoes/mile
LIGHT USE - 2 canoes/mile

6. Guidelines for understanding and determining Optimum Recreation Carrying Capacity. Urban Research Development Corporation. Prepared for BOR U.S.D.I. (appendix D).

Suggested optimum capacity range for boating, non-power flowing water.

	low	base	high
crafts/mile	<u>2</u>	<u>6</u>	<u>12</u>

Guidelines For Using the BOR Capacity Range

- * The carrying capacities presented here are shown as a range of possible optimum capacities from which a recreation manager can choose.
- * The range indicates suggests low and high optimum capacity limits.
- * A base capacity figure is also given within the range; this base figure represents an optimum capacity level which is the most representative optimum capacity level from the results of the base study in which states, participants, administrators/planners were surveyed. This base level assumes that the recreation activity is being conducted under the most normal and typical site conditions and participant situations for that activity.
- * The optimum capacity figures represent instance capacities rather than daily capacities.

The following table summarizes the various studies by user densities and ROS classes.

Table 4.7 -- Summary of findings for the various sources cited by user densities and ROS classes

References	Primitive	SPNM	ROS Classes		Rural	Urban
			SPM	RN		
1. Frequency of user encounters for Trails # of Contacts	6	6-15	low to moderate	moderate to high	moderate to high	Large Number
2. Rocky Mtn. FS USDA Capacity Ranges on trails PAOT/mile	3-5	2-11	2-11	-----None given-----		
3. Ken Eldredge # of people/mile (trails)	3	5	9	17	33	None given
4. Annex D BOR	2	2	2	2	2	2
5. Michigan Rec. Plan 1/ Capacities for canoes/mile by use levels	2		5			10
6. BOR USDI 2/ Crafts/Mile	2		6			12

1/Intensive Use = Urban ROS class; Moderate Use = Semi primitive motorized to Roaded Natural; Light Use = Primitive.

2/High Use = Urban; Base Use = SPM to Roaded Natural and Low Use = Primitive

Interpretation of the information shown in table 4.7 specifically item 1 generally indicates that densities for SPM areas should be low to moderate. The Michigan Recreation Plan (Item 5) recommends a density of 5 canoes/mile for moderate use and the BOR study (item 6) recommends a base figure of 6 crafts/mile for the typical or average river. This indicates that a moderate or average carrying capacity for the White River area should be in the range of 5 or 6 crafts/mile. This figure may represent an average density for an average or typical river. The White River started out as an average river but when it received a semi-primitive motorized classification it became a special river. Therefore, the calculated management carrying capacity for the White River must be something a little more special than one afforded a typical or average river.

3. Using "Primary Factors" to Refine the Management Carrying Capacity. Guidelines for Understanding and Determining Optimum Recreation Carrying Capacity by the Urban Research Development Corporation for the BOR U.S.D.I. will be used to calculate the management carrying capacity for the study. The huge data base used to obtain the range of capacities and the fact the system allows the manager to adjust the capacity range based on the qualities of the recreation area being evaluated makes this system very adaptable in calculating carrying capacity (appendix I).

The BOR Carrying Capacity study allows the base figure for each activity to be moved up or down the range scale by either

Primary Factor 2: The White River is a relatively shallow and slow moving (3 mph current) river with low degree of floating difficulty. Because of these factors it cannot handle as many canoes per mile as the larger rivers can. This factor adversely affects watercraft carrying capacities. In order to compensate for the slow moving current and low difficulty one point should be deducted from the base range (-1).

Primary Factor 3: Approximately 80% of the ownership within the study area is National Forest. This allows the Forest Service to keep the number and distribution of watercraft access points at an optimum level. Since watercraft use is carried out primarily during the day time, trip lengths are relatively short. According to Davis' formula for calculating watercraft carrying capacity, (appendix J) the shorter the trip length the more watercraft a section of river can absorb without increasing density. See table 4.9 page 86 for comparisons of trip lengths and total numbers of watercraft use per year by carrying capacity.

If no additional access points are allowed to develop in the future, daily watercraft launches can be increased at individual access points without increasing watercraft density or decreasing the SPM experience. This produces a very favorable condition. One point should be added to the base figure for this favorable

adding or subtracting the total of the "Primary factors influencing Selection of Optimum Capacity Level". Primary Factors determine whether each observed condition will have a positive (+) or negative (-) effect on the optimum recreation carrying capacity. Positive factors will move the base higher on the scale, negative factors will move the base lower on the scale. This will result in either a higher or lower carrying capacity for the activity being rated.

Three primary factors are considered for the White River in this study.

Primary Factor 1: The White River area including the river, and adjoining land area (fig. 1.3) has been recommended as a potential semi-primitive motorized recreation area. It therefore meets all the criteria for a SPM Area by the ROS classification. The White River is a typical river as it now sets however with the SPM classification it becomes something special. The SPM classification requires that use be low to moderate. The 6 crafts/mile established earlier reflects the upper or moderate range of use for a SPM area. In order to reflect the low range a figure of 2 crafts/mile is used. The middle ground between two crafts and 6 crafts is 4 crafts. Therefore this study recommends the base capacity be reduced by 2 points (-2).

factor (+1).

Tabulating the Primary Factors

Primary Factor 1	=	-2
Primary Factor 2	=	-1
Primary Factor 3	=	<u>+1</u>
Net total		-2

Adding the Primary Factor points and deducting their sum (-2) from the base figure (6) will yield an optimum carrying capacity of 4 crafts/mile ($6-2=4$).

Table 4.8 -- The Optimum Capacity Range for Watercraft on the White River

Crafts/mile	Low				Base		High
	2	3	4	5	-6+		12
			Optimum Carrying Capacity				

The Management Carrying Capacity for the study area is 4 watercraft/mile. This figure fairly represents the center of the low to moderate range of use densities recommended by the ROS guide for a semi-primitive non-motorized experience.

F. Comparing the three carrying capacities and selecting the preferred one.

The figures calculated for social, physical and management carrying capacities will be compared to each other and to the established capacities for the Pine and Pere Marquette rivers. Most importantly they will be compared to existing and proposed management objectives for the area.

The land management planning process requires that carrying capacities for National Forest areas be established using the ROS as a guideline. Comparisons of the three carrying capacities will test the accuracy of the ROS system. If the management carrying capacity is the best density to use for the White River it should be somewhat smaller than the one calculated for social carrying capacity; several times smaller than the physical carrying capacity; and it should be smaller than either the Pine or Pere Marquette rivers.

1. Comparing the three carrying capacities to each other

(Table 4.9)

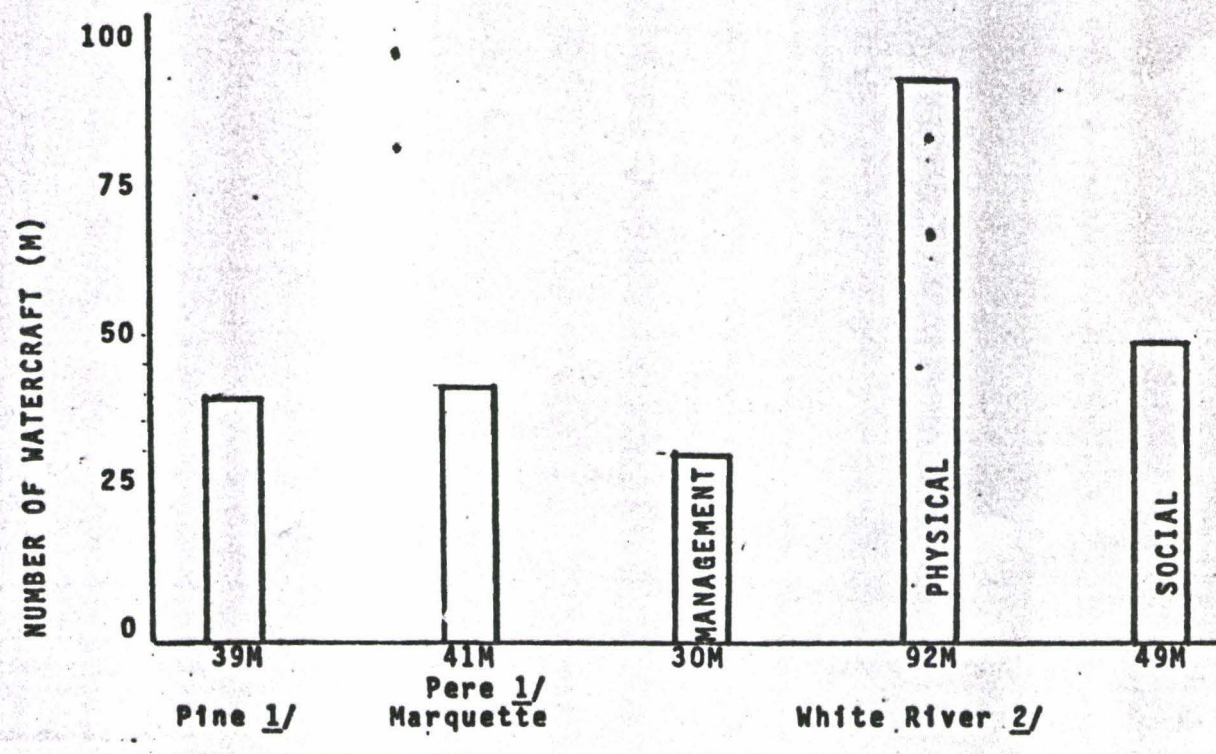
Table 4.9 -- comparison of social, physical and management carrying capacities by numbers of watercraft per day and year for the White River.

River Segments	Miles	<u>Carrying Capacities</u> 1/					
		Social		Physical		Management	
		7 crafts/mile	12 crafts/mile	12 crafts/mile	4 crafts/mile	4 crafts/mile	
		day	year(m)	day	year(m)	day	year(m)
Hesperia - Taylor Bridge	3.5	98	12	181	22	58	7
Taylor Bridge - Pines Point	6	103	12	195	23	62	8
Pines Point - Sischo Bayou	7	107	13	199	24	63	8
Sischo Bayou - Fruitvale Road	8.5	99	12	188	23	60	7
TOTALS	25	407	49	763	92	243	30

1/ See appendix J for calculations of carrying capacities.

2. Comparing the three study area carrying capacities with established capacities for the Pine and Pere Marquette rivers (fig. 4.2).

Fig. 4.2 -- Comparison of the three White River Carrying Capacities to the established carrying capacities for the Pine and Pere Marquette rivers by total numbers of watercraft per year.



- 1/ Annual Carrying Capacities as recommended by their respective management plans (appendix K & L)
2/ Calculated carrying capacities for the White River

3. Comparing the three carrying capacities against existing management objectives (table 4.10).

Table 4.10 -- Comparison Matrix rating each of the three carrying capacities against management objectives

Management Objectives	Carrying Capacities		
	Social	Physical	Management
	Ratings <u>1/</u>		
<u>General</u>			
* Provide high dispersed recreation	+1	+2	0
* Promote water activities	+2	+2	+1
* Maintain high water quality	0	0	+1
* Protect riparian areas	0	0	+1
* Control recreation access	0	-1	+1
* Maintain streambank and shoreline stability	0	-1	+1
* Encourage private investments	+1	+2	+1
<u>Semi-Primitive Motorized Areas</u>			
* Concentration of use low-moderate	-1	-2	+2
* Controls present but subtle	-1	-2	+1
* Moderate probability of experiencing isolation	-1	-2	+1
* High degree of interaction with natural environment	-1	-2	+1
<u>State Country Scenic River</u>			
* Protect natural character of the river	0	0	+2
* No solid waste disposal	0	-1	+1
* Maintain natural vegetation strip	0	0	+1
* No new campgrounds within 300' of river	0	-2	+2
* Maintain high quality fishery	0	-1	+1
* Maintain quality fishing experience	-1	-2	+1
* No new public roads or river crossings	0	-2	0
TOTAL SCORE	-1	-12	+19

1/ Numerical ratings are: +1 positive toward meeting management objectives, +2 strongly positive, 0 neutral, -1 negative, -2 strongly negative effect.

4. Selecting the Preferred Carrying Capacity

Table 4.9 on page 86 indicates that the management carrying capacity is calculated to provide 40% less watercraft use than the social capacity and 68% less than the physical capacity. This relationship is in correct proportions to the capacity desired for a semi-primitive motorized area.

The management carrying capacity allows the smallest total number of annual watercraft use of the five displayed in fig. 4.2 on page 87. Again this is the correct relationship desired for a semi-primitive motorized area and strongly indicates that the calculated management carrying capacity for the White River is in line with the managed capacities on the Pine and Pere Marquette rivers. The annual White River management carrying capacity is smaller than for both these rivers just as it should be because the White River is a smaller and slower moving river and cannot handle the number of watercraft.

Due to high floater demand the Pine and Pere Marquette rivers are presently being managed for a large number of watercraft. The White River is classified as a SPM area and therefore should be managed for low to moderate use to enhance the opportunity to interact with nature. This is reflected in the smaller calculated management carrying capacity.

Table 4.10 on page 88 again displays that the management carrying capacity is by far the best of the three in meeting the management objectives for the study area.

Recommendation

It is the recommendation of this study and supported by the above carrying capacity comparisons, that the optimum carrying capacity for the White River is the management carrying capacity.

The carrying capacity for the White River study area is therefore:

4 watercraft/mile

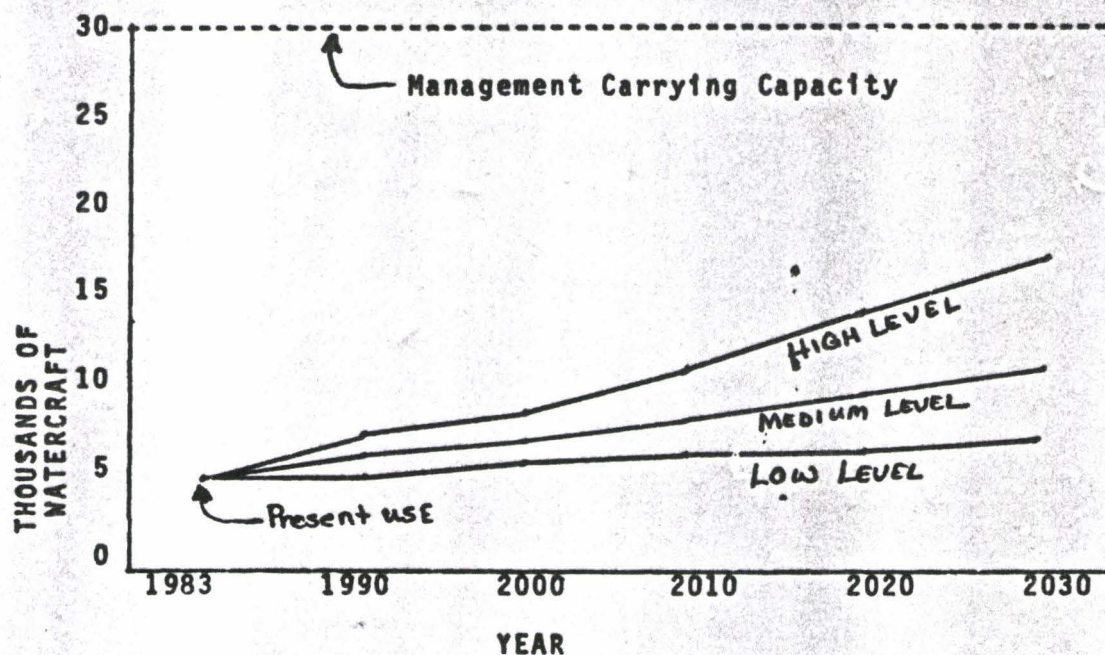
243 maximum watercraft per day total for the study area

30,000 maximum watercraft per year

8. Recommendation concerning the outfitter-guide permit

The carrying capacity for the White River is established. How does this carrying capacity compare with present and projected watercraft use? When, if ever, will the carrying capacity be exceeded? These questions are answered in the following graph.

Fig. 4.3 -- Projected Watercraft use and management carrying capacity for the White River 1983-2030 (1983 = 100%)



1/based on 1980 RPA demand projections (table 1.4 page)

The management carrying capacity of 30M watercraft per year exceeds the number of watercraft that used the White River in 1983 by approximately 7 times.

When the 1983 watercraft use figure of 4,400 is projected to the year 2030 using 1980 RPA demand projections it still falls far short of the management carrying capacity. This shortfall occurs even if the high projection demand figures are used. As stated earlier the impact of the economic recession on recreation activities in Michigan during the early 1980's and the extremely high popularity of the Pine and Pere Marquette rivers will likely prevent watercraft use on the White River from exceeding the medium demand projection level within the 1990-2030 period.

Approve the Permit Application

Increasing the number of watercraft outfitter guide permits is part of the projected growth process for the White River and should be permitted.

One management objective noted earlier is to encourage private enterprise which supplements and supports improving dispersed use on National Forest land. We should be encouraging private enterprise to provide capital and facilities to expand recreation opportunities.

It is recommended that the outfitter-guide permit application for launching additional watercraft on the White River be approved. The permit should stipulate that the management carrying capacity not be exceeded for any day or year or for any one section of the river.

If additional outfitter-guide permit applications are received in the future or if existing permittees request an increase in the numbers of canoes they can launch, the same carrying capacity criteria should be used to determine if approval is acceptable or not.

CHAPTER V

Summary and Conclusions

SUMMARY AND CONCLUSIONS

- * The White River does not offer a pristine wilderness experience but it does provide a unique combination of natural features all of which can enhance the experiences of those who visit it. It does have the potential to provide a quality semi-primitive motorized experience.
- * The White River is small but relatively undeveloped and close to large population centers. These facts will cause the demand for watercraft use on the river to increase in the future.
- * This increase in demand will force river managers to define optimum carrying capacities for their rivers so that the amount of recreation use most appropriate for both the protection of the resource and the satisfaction of management and the participant can be maintained now and in the future.
- * Demand for watercraft use on the White River will be slowed until 1990 due to Michigan's economic problems^s from 1980-1982.
- * Carrying capacity is established through use of management objectives. Management objectives establish parameters for the various carrying capacities.
- * There are two state of the art carrying capacities; social and physical.
- * The third type of carrying capacity used in this study is the management carrying capacity.
- * The Recreation Opportunity Spectrum is used to formulate the parameters for this carrying capacity and is a requirement of the Forest Service Land Management Planning process.

- * The social carrying capacity for the study area is 6-7 watercraft/mile.
- * The physical carrying capacity for the study area is 12 watercraft/mile.
- * The management carrying capacity for the study area is 4 watercraft/mile.
- * When the three carrying capacities are compared the management capacity yields the smallest watercraft density/mile. This supports the ROS requirement that density for a semi-primitive area be low to moderate.
- * When compared to the Pine and Pere Marquette rivers, the White River management capacity is again the smallest. This supports selection of the management capacity figure as the optimum one because the White River is a smaller and slower moving river and is not capable of handling the volume of canoes those two rivers can.
- * When the three carrying capacities are compared against established management objectives the management capacity rates the best because it meets the ROS classification criteria.
- * The management carrying capacity of 4 crafts/mile is the selected capacity for the study area.
- * Watercraft use on the White River will not reach or surpass the management carrying capacity, at least not before 2030.
- * The study recommends that the outfitter guide permit application be approved provided the management carrying capacity not be exceeded for any time period or river segment within the study area.

- * Future permit applications or requests to increase numbers of canoes within the study area should be evaluated against the established management carrying capacity limits for annual, daily or individual segments of the river. If the established carrying capacity would ever be exceeded by adding watercraft to the study area the request should be denied.

BIBLIOGRAPHY

BIBLIOGRAPHY

- An Assessment of the Forest and Range Land Situation in the United States, USDA Forest Service, 1980, p. 8, 21, 101.**
- Beardsley, Wendell G., & J. Alan Wagar, Vegetation Management on a Forested Recreation Site, J. FOR. 69 (10) p. 728-731.**
- Brown, Perry J. "Information Needs for River Recreation Planning and Management", *Proceedings: River Recreation Management and Research Symposium, Minneapolis, MN*, USDA Forest Service, General Technical Report NC-28, 1977, p. 193-201.**
- Chubb, M., & P. Ashton, Park and Recreation Standards Research: The Creation of Environmental Quality Controls for Recreation, Red. to the National Recreation and Park Association, Technical Report 5, Recreation Res. and Planning Unit, Michigan State University, East Lansing, MI, 1969, p. 76.**
- Clark, Roger N., Project Leader, Wildland Rec. Research Project, USDA Promises and Pitfalls of the ROS in Resource Management, Australian Parks and Recreation, May 1982, p. 9-12.**
- Cleland, David T., Recreational Capability of Soils on the White River, Forest Service USDA memo 2550 12/2/83.**
- Cordell, H., Ken & John C. Hender, Renewable Resources Recreation in the United States: Supply, Demand, and Critical Policy Issues, American Forestry Association, Washington, D.C., 1982 p. IV, 2, 12, 14, 41, 58, 59, 79.**
- Countess, Michael L., Walter L. Criley & B.R. Allison, "Problems and Conflicts Associated with River Recreation Programming and Management in the East", *Proceedings: River Recreation Management and Research Symposium, Minneapolis, MN*, USDA Forest Service, General Technical Report NC-28, 1977, p. 147-150.**
- Davis, Lawrence S., Quantification of Connectives for the Recreation Goal of Techcom, Appendix F, Strawman Project, Utah State University, p. 239-250.**
- DeVos, A., & R.H. Bailey, The Effect of Logging and Intensive Camping on Vegetation in Riding Mountain National Park, FOR Chron, 46 (1) 1970, p. 49-55.**

- Doehne, Harry A., "Experiences in Managing River Recreation and River Use in Michigan", *Proceedings: River Recreation Management and Research Symposium, Minneapolis, MN*, USDA Forest Service, General Technical Report NC-28, 1977, p. 110-116.
- Eastman, Robert L., "River Preservation and Recreation Programs", *Proceedings: River Recreation Management and Research Symposium, Minneapolis, MN*, USDA Forest Service, General Technical Report NC-28, 1977, p. 178-182.
- Frissell, Sidney S. Jr., & Donald P. Duncan, Campsite Preference and Deterioration, *J. Forestry*, 1965, p. 256-260.
- Guidelines for Understanding and Determining Optimum Recreation Carrying Capacity, Bureau of Outdoor Recreation U.S. Department of the Interior, BOR #5-14-07-5, Bethlehem, PA, p. I-2,4; II-3, III-3, 5-8, 12, 17.
- Hansen, Edward A., Does Canoeing Increase Streambank Erosion?, U.S. Forest Service Research Note NC-186, 1975, p. 1-4.
- Huron-Manistee Watershed Report, 1983, p. 8, 9, Table 2, Table 3.
- Knopf, Richard C., "Management Problems in River Recreation; What River Floaters are telling Us", *Naturalist*, Summer 1982, p. 13-15.
- Knopf, Richard C., George L. Peterson, & Earl C. Leatherberry, "Motives for Recreational River Floating: Relative Consistency Across Settings", *Leisure Sciences*, Volume 5, number 3, 1983, p. 231-251.
- LaPage W.F. "Recreation Resource Management for Visitor Satisfaction", Unknown source, 1976.
- Leatherberry Earl, C., David W. Lime & Jerrilyn VaVarre Thompson "Trends in River Recreation", *Proceedings, 1980 National Outdoor Recreation - Trends Symposium*, Vol. 1, General Technical Report NE-57, Northeastern Forest Experiment Station U.S. Forest Service, Broomall, PA, 1980, p. 147-164.
- Lewis, Harry J. "Tva's Role in River Oriented Recreation", *Proceedings: River Recreation Management and Research Symposium, Minneapolis, MN*, USDA Forest Service, General Technical Report NC-28, 1977, p. 139.
- Lime, David D., Carrying Capacity, Reprinted from *Trends in Rivers and Trails*, Vol. 16, No. 2, 1979, p. 37-40.

- Lime, David W., "Rivers For Recreation Opportunities and Challenges", *Naturalist*, Vol. 33 Summer Issue 2, 1982 Minneapolis, MN, Cover page.
- Lime, David W., & George H. Stankey, "Carrying Capacity: Maintaining Outdoor Recreation Quality", *Proceedings: River Recreation Management and Research Symposium, Upper Darby, PA*, USDA Forest Service, General Technical Report NC-28, 1971, p. 174-183.
- Lovis, William A., W. Thomas Langhorne, & Sara VanArsdel, A Cultural Resource Overview of the Huron-Manistee National Forest, Michigan, Volume I: Text. Michigan State University Museum Archaeological Survey Report, No. 32 East Lansing, MI, 1978.
- Magill, Arthur W., Five California Campgrounds -- Conditions Improve After 5 Years Recreational Use, USDA Forest Service Res. Paper PSW-62, Pacific SW Forest and Range Experiment Station, Burkley, CA, 1970, p. 18.
- Nielson, Joyce McCarl & Bo Shelby, "River Running in the Grand Canyon: How Much and What Kind of Use", *Proceedings: River Recreation Management and Research Symposium, Minneapolis, MN*, USDA Forest Service, General Technical Report NC-28, 1977 p. 168-177.
- Ohman, Lewis F., "Ecological Carrying Capacity", *Outdoor Recreation Research; applying the results*, Marquette, MI workshop June 19-21, 1973, p. 24-27.
- Priesnity, Michael, "The Rivers that Run on Borrowed Time", *Naturalist*, Vol. 26 Spring 1975, Minneapolis, MN, p. 7-12.
- ROS Users Guide, USDA Forest Service, p. 5, 6-8, 22, 26.
- Regional Guide for the Eastern Region, United States Department of Agriculture, Forest Service, Milwaukee, WI, 1983, p. 4-17, Table 4-10.
- Report on River Use Rules for Certain Stretches of the AuSable, Manistee, Pine and Pere Marquette Rivers, Michigan Department of Natural Resources, 1972, p. A-2, C-2, C-3.
- Schreyer, Richard, Sociological and Political Factors in Carrying Capacity Decision Making, paper presented at the Visitor Capacity Conference, National Park Service, Ft. Worth, TX, April 20-30, 1976, p. 228-254.

Settergren, Carl D., "Impacts of River Recreation Use on Stream-bank Soils and Vegetation -- State-of-the-knowledge", *Proceedings: River Recreation Management and Research Symposium, Minneapolis, MN*, USDA Forest Service, General Technical Report NC-28, 1977, p. 55-59.

Shafer, Elwood L. Jr., The Average Camper Who Doesn't Exist, USDA Forest Service Research Paper NE-142, Northeastern Forest Experiment Station, Upper Darby, PA, 1969, p. 22.

Solomon, Michael J., Forest Service memo 2500, November 22, 1983.

Wagar, J.A., The Carrying Capacity of Wildlands for Recreation, For Sci. Manager 7:23.

White River Planning Group, Natural River Plan - White River, Cooperating with the Michigan Department of Natural Resources, 1975, p. 1-2, 5-8, 11, 13, 17, 19.

APPENDICES



Joiner
WC

WHITE CLOUD R.D.

1920 Land and Resource Management Planning

Date: January 18, 1984

Subject: Recreation Management on the Existing and
Potential Semiprimitive Areas--Meeting Notes



MANAGER _____
CLERK _____
TMA _____
TECHS _____
ORA _____
TECHS _____

To: Management Team

On January 7, 1984 a meeting was held with the Manistee District Rangers and selected SO staff to discuss the existing and potential semiprimitive motorized areas. This meeting was attended by Bill Erickson, Gordon Joiner, Owen Gusler, Russ Garrigus, Jim Bernier, Bill Irvine, Leon Blashock, Mel Goldie, Jeff Pullen, Ron Scott, and Larry Leefers. The following are the notes from this meeting.

Purpose/Introduction

1. To gather staff input on the existing and potential semiprimitive areas to determine which should be managed under the semiprimitive ROS classification.
2. The input received will be used in alternative formulation. For the areas chosen for SPM or SPNM management the most desirable decade of conversion should be determined.

Mel provided a brief introduction to the meeting and what would be presented for discussion.

I mentioned that it is important to realize that implementation for the plan is decade 1 so the areas that come into solution in the first decade, or options that allow them to come into solution in the first decade, should be looked at closely. There are options for each area that have no timber management; they are the minimum level prescriptions, the Medium 9 prescription (conversion to SPM) and the N9 prescription (conversion to SPNM).

Discussion/Questions

The following items were discussed before we started looking at the specific areas.

-- If we select an area to go to SPM will it ever, in an alternative, come out as RN or are we forcing it to SPM in every alternative? If it is a potential semiprimitive area and we eliminate the RN options it will still have the minimum level option, which is RN, to select just not the others that show active management.

-- What if we determine that an area is suited for SPM but are not really concerned how it is managed? In a case like this, the decision can be "yes, it is suited for SPM but we would like to leave the model all the available choices."



-- In the center of the area are two sections owned by the Hesick School District. These are under a seven year timber contract.

-- A county road runs between AA #908 and AA #911.

-- The area has some nice features, but to meet intent of ROS the boundary should be adjusted.

-- If the private land along the east edge was put outside the boundary the area might be suited for SPNM.

-- The area along the east side is highly developed.

Decision/Conclusion

This analysis area, number 908, should be limited to choosing the SPM or RN prescriptions. It does not meet the ROS guidelines for SPNM and will not in the foreseeable future.

AA #911 - Briar Hills Addition

-- Many of the problems with this area are related to those in AA #908.

-- The roads along the boundaries of this area present some problems.

-- The area is predominantly one type, northern hardwoods, and one age.

-- It is not the most visually attractive area but does meet the requirements.

Decision/Conclusion

Leave the model all the available options.

AA #673

This area was discussed only briefly and it was decided to leave the model all available options.

The Manistee River (including the Pine River) study area (AA #655) was discussed only briefly and the decision was to leave the model all the available choices.

The Nordhouse Dunes and Sensibar Tracts were discussed and the decision was to leave the model all the available choices (AA #659, #671).

The final area discussed was the White River potential semiprimitive area (AA #913). The area contains about 4,000 acres and is the southernmost area on the Forest.

White River - Discussion Items

-- This area has been heavily logged recently and in the past.

-- The cuts are unsightly. They are in long strip type cuts. These have an undesirable visual effect.

--- The area receives quite a bit of recreation use.

-- We have good ownership in this area. It is bordered on three sides by rivers.

-- There is an interpretive trail located in the area.

-- There is a wide variety of vegetative types in the area.

-- The many small openings throughout the area add to its quality as a recreation area.

-- The area has one maintained county road leading to a fishing access site.

-- There is a proposed weir along the boundary of the area.

Decision/Conclusion

The area meets the requirements for SPM. Leaving the model all available choices seems best for this area.

Direction

Based on the discussions and decisions mentioned in this document, the following management direction now applies:

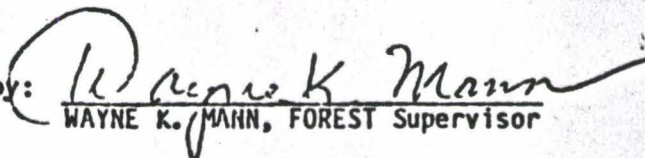
-- For the areas not identified for management as SPM OR SPNM the Standards and Guidelines, from the goal package, for the management of Roaded Natural areas (Goals 4.2, 2.1, and 4.3) will apply. The RN Standards and Guidelines will apply to all management activities that occur before plan implementation.

-- The remainder of the SPM and SPNM areas will be managed according to their intended ROS classification.

Prepared by:


JEFFERY G. PULLEN, Forester, LMP

Approved by:


WAYNE K. MANN, FOREST Supervisor

WHITE RIVER

I. Area

Gross acres 3,988

Net acres 3,511

II. Terrain

Sandy and flat except near the rivers.

III. Vegetation

The predominate timber type is sawlog size well stocked oak. Sometimes this timber type is mixed with aspen, red maple, and jack pine.

Scattered throughout the area are natural openings of various sizes and occasionally along the flood plain of the river an extra large old maple or white pine can be found.

IV. CapabilityV. Evidence of Human Activity

- A. Timber Harvesting - Within the area there are some very large clearcuts. Over 10 years ago several large clearcuts were made and a portion of the area was strip cut. These strip cuts were $\frac{1}{4}$ of a mile wide, with $\frac{1}{4}$ of a mile of uncut timber between cuts. The cuts were 1-3 miles in length and are still evident because of their size and because some parallel roads and are regenerating slowly. They appear as large brushy fields.

The more recent clearcuts are also quite large. The slash and unwanted timber within these cuts has been cleaned up well, and islands of uncut timber has been left in some of them to soften the visual impact of the cutting. However, because of their size they are still quite evident and likely to remain that way for quite some time.

- B. Other - There is a developed boat access to the North Branch of the White River. Toilets are provided at this site and it attracts camping as well as fishing access activity.

Several dispersed campsites were found along the rivers.

VI. Attractiveness

This area isn't especially attractive. The terrain is flat except as it drops down to the flood plains along the rivers. The timber type is almost a monotype of oak with only gradual changes within the oak as it changes from oak to oak mixed with aspen, red maple, or jack pine. The flood plains along the river and the occasional natural openings that occur are quite distinctive from the adjoining timber and create enough variety to judge the vegetation as being "common" in attractiveness.

The best visual assets of this area are the rivers. The area is bounded on three sides by rivers. The South Branch of the White River forms the south and east boundary of the area. This river is fairly wide, slow moving and the water is murky. The shoreline tends to be a flood plain with the higher banks back in and away from the river. There are, however, places where high banks border the river and create some scenic views. The North Branch of the White River forms the west border of the area. It is a narrower stream than the South Branch. It has a swifter current and the water is clearer. In general the North Branch has a narrower flood plain so the banks are a bit more evident, but the banks aren't as high so views of the river aren't as scenic, although the water of this river is more attractive. Knapp Lake, in Section 17, although small and shallow, forms an attractive scene. The water resource of this area is judged as being "common."

The large clearcuts, both the old and more recent cuts, are judged as having a negative impact on the attractiveness of this area.

<u>Feature</u>	<u>Rating</u>	<u>Score</u>
Terrain	Minimal	1
Vegetation	Common	2
Water	Common	2
	Negative Impact	-1
	Total	4

This area is rated as being only minimally attractive (see attached attractiveness rating system).

VII. Recreation

- A. Existing Uses - The area probably receives its fair share of hunting and U.R.V. use. Dispersed camping by fishermen, canoeists, and persons just seeking a camping spot with a view, occurs along the river.

The North and South Branch of the White River are considered fairly good fishing streams. Both contain trout and attract a considerable amount of fishing use. There is a developed boating access, established by the State in the NW $\frac{1}{4}$ of Section 25, for fishermen.

Canoeing is fairly popular on the South Branch of the White River, and to a much lesser extent, it also occurs on the North Branch.

- B. Potential Uses as a Semiprimitive Motorized Area - O.R.V. trails or hiking trails could be established to some of the more scenic spots along the rivers to attract dispersed campers.

Fishing access points interconnected by an O.R.V. and/or hiking trail for fishermen seeking solitude and the experience of fishing at a spot difficult to reach could be an attraction of the area.

Canoeing appears to be more popular on the South Branch of the White River. Increased canoeing use is likely to continue as controls on this use are applied on more popular rivers within the State. Primitive camping spots isolated from roads could, therefore, provide the canoeist with a primitive camping experience.

VIII. What needs to be done to make the Area Semiprimitive Motorized

- A. Roads - We need to acquire control of 6 miles of county road within the area. This should not be a problem since these roads primarily serve National Forest lands. This will especially be true if the isolated parcel of private lands are acquired.

Maintenance to the roads should cease so they can be allowed to deteriorate and some roads will need to be closed or dug up to make them impassable to conventional vehicles.

- B. Lands - Approximately 320 acres of scattered private ownership within the area should be purchased to insure that we can control access and preserve the remoteness criteria.

IX. Conflicts with Other Uses

A lamprey weir is to be constructed by the State in the NE 1/4 of Section 26 of the North Branch of the White River. Road access to the weir will be through the area. This will require upgrading portions of an existing road and some new road construction.

X. Recommendations

The area be retained as a Semiprimitive Motorized area. Although the area is not especially scenic the influence of the two rivers is probably strong enough to attract users, such as canoeists and fishermen seeking a semiprimitive experience. Canoeing use and the need to provide canoeists with a dispersed camping opportunity is liable to increase on these two rivers as controls limit the use on other more popular rivers in the State.

The Forest should acquire control of the county roads in the area and close or otherwise make existing roads impassable to conventional vehicles. With regards to access to the lamprey weir, this could be handled with a gate and limitations on the degree of development permitted for access to the weir. It will also be necessary to obtain ownership of private lands within the area.

To qualify as semi-primitive motorized area an area must meet the criteria of:

1. Remoteness 1 mile away from roads or trails used by a standard two-wheel driver vehicle, or have roads that could be closed to that use.
2. Size 2,500 acres or larger. If area adjoins other public land with similar characteristics it could be considered as part of the acreage.
3. Evidence of Human Aside from primitive roads and trails the natural setting may be altered but it would not draw the attention of motorized users of the area. Structures in the area are rare and isolated.
4. Social Setting Criteria Contact with other users of the area are less than per
5. Managerial Setting Some minor subtle controls can be found within the area. Trail markers a sign or a toilet are generally found at a terminal area.

Aside from meeting the above criteria a semi-primitive motorized area should be attractive, have opportunities for the activities the public would likely pursue within them, and be capable of sustaining use anticipated with minimal damage to the resource.

Attractiveness will be evaluated according to the variety class definitions of "Distinctive", "Common" or "Minimal" as defined by the Attractiveness Evaluation attached.

Opportunities are the following activities as defined in the RIM Handbook (2309.11) that appear to be compatible with a Semi-Primitive Motorized Area:

viewing scenery
over the snow vehicle use
foot travel
horseback riding
other watercraft/
tent camping
hunting
gathering

motorcycle use
all terrain vehicle use
bicycling
canoeing ✓
fishing
cross-country skiing
nature study

Areas selected as S.P.M. should be especially well suited for one or more of these activities.

An area is capable of becoming S.P.M. if it has the soil and vegetation cover type to withstand the activity it is expected to attract.

In addition to the above an area selected as S.P.M. should not seriously inhibit a higher and better use of the area or violate Federal, State or local laws and regulations.

Each semi-primitive area will be evaluated by using the attached criteria sheet. Areas requiring changes to make them suitable will be shown on a 2" per mile map along with a narrative explaining the change.

APPENDIX B

**RECREATION OPPORTUNITY
SPECTRUM**

Table A-1

Recreation Opportunity Spectrum Activity Characterization¹

Primitive	Semiprimitive Nonmotorized	Semiprimitive Motorized	Roaded Natural	Rural	Urban
<u>Land Based:</u>	<u>Land Based:</u>	<u>Land Based:</u>	<u>Land Based:</u>	<u>Land Based:</u>	
Viewing Scenery Hiking and Walking Horseback Riding Tent Camping Hunting Nature Study Mountain Climbing	Viewing Scenery Automobile (off-road use) Motorcycle and Scooter Use Specialized Landcraft Use Aircraft Use Hiking and Walking Horseback Riding Camping Hunting Nature Study Mountain Climbing	Viewing Scenery Viewing Activities Viewing Works of Human-Kind Automobile (includes off-road use) Motorcycle and Scooter Use Specialized Landcraft Use Train and Bus Touring Aircraft Use Aerial Trams and Lifts Use Hiking and Walking Bicycling Horseback Riding Camping Picnicking Resort and Commercial Services Use Resort Lodging Recreation Cabin Use Hunting Nature Studies Mountain Climbing Gathering Forest Products Interpretive Services	Viewing Scenery Viewing Activities Viewing Works of Human-Kind Automobile (includes off-road use) Motorcycle and Scooter Use Specialized Landcraft Use Train and Bus Touring Aircraft Use Aerial Trams and Lifts Use Hiking and Walking Bicycling Horseback Riding Camping Picnicking Resort and Commercial Services Use Resort Lodging Recreation Cabin Use Hunting Nature Studies Mountain Climbing Gathering Forest Products Interpretive Services	Viewing Scenery Viewing Activities Viewing Works of Human-Kind Automobile (includes off-road use) Motorcycle and Scooter Use Train and Bus Touring Aircraft Use Aerial Trams and Lifts Use Hiking and Walking Bicycling Horseback Riding Camping Picnicking Resort and Commercial Services Use Resort Lodging Recreation Cabin Use Hunting Nature Studies Gathering Forest Products Interpretive Services Team Sports Participation Individual Sports Participation Games and Play Participation	
<u>Water Based:</u>	<u>Water Based:</u>	<u>Water Based:</u>	<u>Water Based:</u>	<u>Water Based:</u>	
Canoeing Other Watercraft (nonmotorized use) Swimming Fishing	Boating (powered) Canoeing Sailing Other Boating Swimming Diving (skin or scuba) Fishing	Boating (powered) Canoeing Sailing Other Boating Swimming Diving (skin or scuba) Fishing	Tour Boat and Ferry Use Boat (Powered) Canoeing Sailing Other Watercraft Use Swimming and Waterplay Diving (skin and scuba) Water Skiing and Water-Sports Fishing	Tour Boat and Ferry Use Boat (Powered) Canoeing Sailing Other Watercraft Use Swimming and Waterplay Diving (skin and scuba) Water Skiing and Water-Sports Fishing	
<u>Snow and Ice Based:</u>	<u>Snow and Ice Based:</u>	<u>Snow and Ice Based:</u>	<u>Snow and Ice Based:</u>	<u>Snow and Ice Based:</u>	
Snowplay Cross-Country Skiing/Snowshoeing	Ice and Snowcraft Use Skiing, Downhill Snowplay Cross-Country Skiing/ Snowshoeing	Ice and Snowcraft Use Skiing, Downhill Snowplay Cross-Country Skiing/ Snowshoeing	Ice and Snowcraft Use Ice Skating Sledding and Tobogganing Downhill Skiing Snowplay Cross-Country Skiing/Snowshoeing	Ice and Snowcraft Use Ice Skating Sledding and Tobogganing Downhill Skiing Snowplay Cross-Country Skiing/Snowshoeing	

¹These activities (from R1 N FSN 2309.11) are illustrative only. Specific additions or exceptions of activities within a ROS class may occur, depending upon local forest situations.

Table A-2

Recreation Opportunity Spectrum Setting Characterization

Primitive	Semiprimitive Nonmotorized	Semiprimitive Motorized	Heavily Natural	Rural	Urban
Area is characterized by essentially unmodified natural environment of fairly large size. Interaction between users is very low and evidence of other users is minimal. The area is managed to be essentially free from evidence of human-induced restrictions and controls. Motorized use within the area is not permitted.	Area is characterized by a predominantly natural or natural-appearing environment of moderate-to-large size. Interaction between users is low, but there is often evidence of other users. The area is managed in such a way that minimum onsite controls and restrictions may be present, but are subtle. Motorized use is not permitted.	Area is characterized by a predominantly natural or natural-appearing environment of moderate-to-large size. Concentration of users is low, but there is often evidence of other users. The area is managed in such a way that minimum onsite controls and restrictions may be present, but are subtle. Motorized use is permitted.	Area is characterized by predominantly natural-appearing environments with moderate evidence of the sights and sounds of m.a.s. Such evidence usually harmonizes with the natural environment. Interaction between users may be low to moderate, but with evidence of other users prevalent. Resource modification and utilization practices are evident, but harmonize with the natural environment. Conventional motorized use is provided for in construction standards and design of facilities.	Area is characterized by substantially modified natural environment. Resource modification and utilization practices are to enhance specific recreation activities and to maintain vegetative cover and soil. Sights and sounds of humans are readily evident, and the interaction between users is often moderate to high. A considerable number of facilities are designed for use by a large number of people. Facilities are often provided for special activities. Moderate densities are provided far away from developed sites. Facilities for intensified motorized use and parking are available.	Area is characterized by a substantially urbanized environment, although the background may have natural-appearing elements. Renewable resource modification and utilization practices are to enhance specific recreation activities. Vegetative cover is often exotic and manicured. Sights and sounds of humans, onsite, are predominant. Large numbers of users can be expected both onsite and in nearby areas. Facilities for highly intensified motor use and parking are available with forms of mass transit often available to carry people throughout the site.

Table A-3

Recreation Opportunity Spectrum Experience Characterization¹

Primitive	Semiprimitive Nonmotorized	Semiprimitive Motorized	Roaded Natural	Rural	Urban
Extremely high probability of experiencing isolation from the sights and sounds of humans, independence, closeness to nature, tranquility, and self-reliance through the application of woodsmen and outdoor skills in an environment that offers a high degree of challenge and risk.	High, but not extremely high, probability of experiencing isolation from the sights and sounds of humans, independence, closeness to nature, tranquility, and self-reliance through the application of woodsmen and outdoor skills in an environment that offers challenge and risk.	Moderate probability of experiencing isolation from the sights and sounds of humans, independence, closeness to nature, tranquility, and self-reliance through the application of woodsmen and outdoor skills in an environment that offers challenge and risk. Opportunity to have a high degree of interaction with the natural environment. Opportunity to use motorized equipment while in the area.	About equal probability to experience affiliation with other user groups and for isolation from sights and sounds of humans. Opportunity to have a high degree of interaction with the natural environment. Challenge and risk opportunities associated with more primitive type of recreation are not very important. Practice and testing of outdoor skills might be important. Opportunities for both motorized and nonmotorized forms of recreation are possible.	Probability for experiencing affiliation with individuals and groups is prevalent, as is the convenience of sites and opportunities. These factors are generally more important than the setting of the physical environment. Opportunities for wilderness challenges, risk-taking, and testing of outdoor skills are generally unimportant, except for specific activities, such as downhill skiing, for which challenge and risk-taking are important elements.	Probability for experiencing affiliation with individuals and groups is prevalent, as is the convenience of sites and opportunities. Experiencing natural environments, having challenges and risks afforded by the natural environment, and the use of outdoor skills are relatively unimportant. Opportunities for competitive and spectator sports and for passive uses of highly human-influenced parks and open spaces are common.

¹These experiences are highly probable outcomes of participating in recreation activities in specific recreation settings.

APPENDIX C

NO SERIOUS USER CONFLICTS

The most outstanding attribute the White River has is that no major user conflicts exist at the present time. In light of all the current conflicts and competition for natural resource space throughout the nation; this is a unique situation. What factors contribute to this situation. The answer lies in the natural and social characteristics of the river. They are outlined below:

- * Fishing occurs either in the early spring or late fall outside the established watercraft use season.
- * The State Country Scenic River Plan prohibits use of motors above Fruitvale Road.
- * Nearly all warm weather fishing is done from stream banks by a few avid fishermen who drive the rough two track roads to get to the river.
- * 60% of the shoreline is owned by the National Forest. It is relatively undeveloped and is represented by either low wet areas or high wooded or sandy banks. These conditions are not conducive to camping, hiking or picnicing. Very little stream bank deterioration is occurring at the present time.
- * Very few private homes are found along this stretch of the river. This means that opportunity for trespass, vandalism, boisterous behavior and other conflict situations are reduced to a minimum.
- * Until 1983 two liveries served 90% of the user demand on the White River each sharing public put-in and take-out points.

Each fully cooperates with each other and the Forest Service.

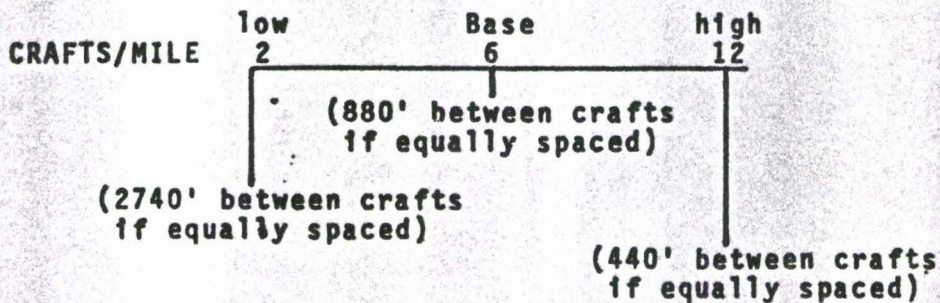
- * The two liveries and the Boy Scouts have cooperated in controlling litter along the river. One livery schedules at least two clean-up patrols each year.
- * Complaints of over crowding is not a problem because of the moderate use the river receives. Even on the most popular weekends 90% of the watercraft users are there with a group of people looking for a social experience rather than a primitive one.
- * User safety is not a concern because the river is slow moving and shallow.

APPENDIX D

Suggested Optimum Capacity ranges for boating; non-power flowing water - Optimum Recreation Carrying Capacity - BOR

BOATING, NON-POWER FLOWING WATER

Suggested Optimum Capacity Range



Primary Factors Influencing Selection of Optimum Capacity Level

- * Refer to Factors A and C on page III-13
- * Current Speed and Degree of Difficulty - The faster the current speed and the greater the degree of difficulty, the lower the instant capacity.
- * Width of Water Body - Very wide waterways can accommodate more crafts per mile.



United States
Department of
Agriculture

Forest
Service

Reply to: 2550

Date: December 2, 1983

Subject: Recreational Capability

To: Gordon Joiner

I have examined the seven locations along the White River being evaluated for potential recreational uses. This memo describes the physical character of these locations, presents criteria for rating capability to sustained current levels and types of recreational uses, and contains a table summarizing criteria and ratings per location.

Physical Character

Pines Point: SW $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 9, T13N, R15W. This location consists of lacustrine (water laid) deposits at the river's edge. The soil observation made revealed: 1) 10 inches of high organic matter and fine sandy loam, over 2) 12 inches silt loam. over 3) 8 inches clay loam, over 4) water saturated sands. The water table rises to somewhere near 20 inches of the soil surface in the spring, dropping to 30 inches during the majority of the year. This site has high soil fertility, excellent water relationships, moderate compaction potentials, and low erosion potentials. Overall, this is a highly resilient system which poses few if any capability limitations for uses described in Table 1.

The area is probably in a 2-5% frequency floodplain zone, meaning flooding will occur in 1:50 to 1:20 years.

Access into this area along the existing two track is good. Slopes are low to moderate, erosion is not a problem at this time. Landform is sandy normal, no water erosion through subsurface or overland flow is anticipated.

Podunk: SW $\frac{1}{4}$ SW $\frac{1}{4}$ Sec. 16, T13N, R15W. This location at the river's edge is literally a "silt trap". The soil consists of 10 inches of silt and fine silts loam over water saturated loam. This area has a high flooding frequency, it absolutely part of the 100% frequency floodplain, and may qualify as a true "wetland". Although fertile, this site poses problems with drainage, vehicle operability, and soil compaction potentials. During the early spring, water will often be at or above the soil surface.



Access into this area along the currently existing two track will be limited during the spring and following high intensity and/or long duration rains. Vehicular traffic will require seasonal restrictions or upgrading the two track, including placement of culverts in low and seep areas. Areas immediately adjacent to the river are unsuited for vehicular traffic.

Knapp Lake: NE $\frac{1}{4}$ SW $\frac{1}{4}$ Sec. 20, T13N, R15W. This location consists of lacustrine deposits at the river's edge. The soil is 10 inches of high organic matter and fine sandy loam over silt loam. The water table rises to within 10 inches of the soil surface during the spring, dropping to around 18 inches during the remainder of the year. The site is highly fertile, has a relatively low flooding frequency (approximately 1:10 years), a moderate compaction potential, and low erosion potential at the river's edge.

Access to the area along the existing two track will require some road improvement, with little or no maintenance requirements anticipated following improvement. The main problem with this road is the lack of an adequate drain channel for the overland water flow being concentrated in the two track. The soils of the access area are sandy; consequently no seepage should occur once alternate drainage is established.

Sischo: SE $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ and SW $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ Sec. 30 T13N R15W. This area is a terrace remnant (9000 years before present) of a former river level. The landing on this terrace lies around ten feet above the current floodplain and is consequently well drained the soil is: 1) 5 feet of sand over 2) 12 inches of loamy sand over stratified gravelly sandy loam and sandy clay loam. The site has low soil fertility (in upper 40 inches), an extremely low compaction potential, and a moderately high erosion potential due to relatively steep slopes immediately adjacent to the river.

Access into this area is good. The road is located on flat to gentle slopes, is sandy, and therefore poses few if any operability problems.

North Branch: (Limited considerations to packing area only): SE $\frac{1}{4}$ E $\frac{1}{4}$ SE $\frac{1}{4}$ Sec. 26, T13N, R16W. This location is well drained, sandy, flat and in a stable condition from the vegetative soil disturbance standpoint. The soil is 4 feet of sands over stratified sand and sandy clay loam. No problems with erosion, compaction, wetness, or operability are anticipated in the access route or parking area.

Twin Rollaway: NE $\frac{1}{4}$ SW $\frac{1}{4}$ Sec. 35, T15N, R16W: This area immediately adjacent to the river has high slope gradients with moderate slope lengths. The soil is sandy throughout. Severe erosion is already evident, some mitigating measures to arrest this erosion have been taken. This area is an extremely fragile condition presently, due to its history (rollaway), and the fact that all the surface organic matter and several feet of the upper sandy profile have eroded in places.

Access is on flat, well drained sands, no problems are anticipated.

Skeels: (Limited consideration to parking area only) NE $\frac{1}{4}$ SW $\frac{1}{4}$ Sec. 34, T13N R16W. This location is on a river terrace, is sandy, well drained, on moderate to flat slopes. No problems from any standpoint are anticipated.

Adjacent to the river is a small area (3 feet wide) through which sediment may be discharging into the river. This spot needs further evaluation.

David Cleland

DAVID T. CLELAND
Soil Scientist

APPENDIX F

Water Quality Index Parameter

The following eight parameters and weights were selected for the stream water quality index for Region 9.

Turbidity	15
pH	15
Alakalinity	15
Fecal coliform	10
Nitrate nitrogen	10
Total phosphate	10
Color	10
Dissolved oxygen	15



United States
Department of
Agriculture

Forest
Service

Huron-Manistee N.F.'s

Reply to: 2500 Watershed

Subject: Canoe Use

Date: November 22, 1983



To: District Ranger, White Cloud R.D.

Enclosed are two publications pertaining to our discussion of increasing canoeist use and stream degradation:

Canoeists Suggestions for Stream Management in the Manistee National Forest of Michigan. M.J. Solomon and E.A. Hansen, 1972.

Does Canoeing Increase Streambank Erosion? E.A. Hansen, 1975.

I have marked both publications where discussion is pertinent.

The remarks from the first publication indicate that canoeists are seeking solitude (19%). Therefore, the more people, the less solitude. Nine percent of the people stated that there were too many people using the river. It is significant that almost all of the complaints made during this study occurred on weekends or holidays when crowding is the worst. Rowdy canoeists complaints increased disproportionately as use increased but only a small segment of users (1%) suggested regulating the number of canoes. Marked sections on pages 9 and 10 give Ed's and my opinion on reducing canoe use and its implications.

The second publication gets very specific to your concerns.

Ed cites on page 2 that "There was no evidence that streambank erosion was accelerating, even with the large increases in canoeing." On page 3, he further elaborates:

"In conclusion, it appears that the passage of large numbers of canoes does not have any observable effect on streambank erosion. Only when canoeists stop and camp or walk on banks does erosion begin."

This supports my opinions that I expressed to you on the phone. Namely, that most of our larger streams can physically pass an extremely high number of canoes without significant damage if good entrance, exit and intermediate stops are provided. Social impacts of too many users will come into play far sooner than environmental impacts. Two possible exceptions do occur:

- 1) Rowdiness and alcohol can encourage lashing together of canoes and resultant damage to streambanks or fish covers because of lack of steering control.



- 2) Very inexperienced canoeists on relatively high gradient streams. Some canoeists on the Pine River do not have enough control of their crafts to avoid frequently hitting streambanks. This can initiate or aggravate erosion.

If I can be of further help let me know.

Michael J. Solomon
MICHAEL J. SOLOMON
Hydrologist

Enclosures

APPENDIX H

Proposed Capacity Coefficient Ranges as recommended in the Huron-Manistee Land Management Plan

As a part of the land management planning process the Huron-Manistee National Forest has adopted .083-.088 PAOT/Acre as its capacity coefficient range for semi-primitive motorized recreation. This figure can be applied to land based activities but it is not a supportable figure when applied to water activities. If the .083 PAOT/Acre capacity coefficient were applied to the 25 mile study area only .34 canoes per mile would be allowed if the semi-primitive motorized classification were to be maintained. The calculations to support this are found below.

Recommended Capacity Coefficient for SPM areas is .083 PAOT/Acre
The study area is 25 miles long.

Average width of the study area is 70 feet.

Average number of users per canoe is 2.1 for the Huron-Manistee National Forest.

Using these figures the Carrying Capacity is calculated in the following manner:

$$\text{Acres} = \frac{25 \text{ miles} \times 5,280 \text{ feet} \times 70'}{43,560} = 212$$

$$\text{PAOT for the study area} = 212 \times .083 = 18$$

$$\text{PAOT/MILE} = \frac{18}{25} = .72$$

$$\text{Canoes/mile} = \frac{.72}{2.1} = .34$$

This is not a reasonable watercraft density/mile figure for the White River and will not be used in this study.

APPENDIX I

Guidelines for understanding and determining optimum recreation carrying capacity - Urban Research Development Corp. - for the Bureau of Outdoor Recreation; U.S.D.I., 1977.

Information in this study can be directly applied to the White River in developing optimum carrying capacities because:

- 1. It is devoted exclusively to quantifying carrying capacities.**
- 2. The data can be used at almost every stage of the planning job.**
- 3. It gives ranges, not a single specific number.**
- 4. It offers an approach for use in tailoring recreation carrying capacities to a wide variety of possible circumstances.**
- 5. The recommendations are based upon extensive research and field survey interviews.**
- 6. It is a composite of information taken from:**
 - a. each states current recreation space standards**
 - b. recreation users in 8 states**
 - c. administrators/planners survey**

APPENDIX J

WATERCRAFT CARRYING CAPACITY - WHITE RIVER

CARRYING CAPACITY FORMULA 1/

$$UV = (AH)/(ah) \times d$$

Unit of Measure

UV = Watercraft per year	Number
A = Distance of river segment	Miles (nearest tenth)
H = Hours/day available for use (9 hours max. - average trip time) 2/	Hours (nearest 1/4 hour)
a = Desired spacing between watercraft	.15 miles (792 feet) Social C.C.
	.08 miles (406 feet) Physical C.C.
	.25 miles (1320 feet) Management C.C.
h = Average time each water- craft is on the river (based on an average watercraft speed of 3 MPH and a 30 minute rest stop) determined as follows:	Hours (nearest 1/4 hour)

Trip distance

3 mi/hr. + .50 hour rest period

d = Number of available use days in the season 3/ - Days (est. 120)

CALCULATIONS

1/Qualification of Connectives for the Recreation Goal of Techcom -
L.S. Davis, Utah State University.

2/Watercraft hours are 9 a.m.-6 p.m. If the trip time for a segment
takes 3.75 hours then the last canoe could not be launched after
2:15 p.m. in order to be off the river by 6 p.m.

3/Estimated season is mid-May until mid-September.

1. Hesperia - Taylor Bridge

WATERCRAFT

Per day Per year

Social UV $\frac{3.5 \text{ miles} \times 7.25 \text{ hrs.} \times 120}{.15 \text{ mi/craft} \times 1.75} =$ 98 11,714

Physical UV $\frac{3.5 \times 7.25 \times 120}{.08 \text{ mi/craft} \times 1.75} =$ 181 21,771

Management UV $\frac{3.5 \times 7.25 \times 120}{.25 \text{ mi/craft} \times 1.75} =$ 58 6,927

2. Taylor Bridge - Pines Point

Social UV $\frac{6 \text{ miles} \times 6.5 \times 120}{.15 \times 2.5} =$ 103 13,440

Physical UV $\frac{6 \times 6.5 \times 120}{.08 \times 2.5} =$ 195 23,400

Management UV $\frac{6 \times 6.5 \times 120}{.25 \times 2.5} =$ 62 7,488

3 Pines Point - Sischo Bayou

Social UV $\frac{7 \times 6.25 \times 120}{.15 \times 2.75} =$ 107 12,805

Physical UV $\frac{7 \times 6.25 \times 120}{.08 \times 2.75} =$ 199 23,864

Management UV $\frac{7 \times 6.25 \times 120}{.25 \times 2.75} =$ 63 7,609

4. Sischo Bayou - Fruitvale Road

Social UV $\frac{8\frac{1}{2} \times 5.75 \times 120}{.15 \times 3.25} =$ 99 11,999

Physical UV $\frac{8\frac{1}{2} \times 5.75 \times 120}{.08 \times 3.25} =$ 188 22,600

Management UV $\frac{8\frac{1}{2} \times 5.75 \times 120}{.25 \times 3.25} =$ 60 7,200

APPENDIX K

WATERCRAFT CARRYING CAPACITY - PERE MARQUETTE RIVER

CARRYING CAPACITY FORMULA ^{1/}

$$UV = (AH)/(ah) \times d$$

Unit of Measure

UV = Watercraft per year

Number

A = Distance of river segment

Miles (nearest tenth)

H = Hours/day available for use
(9 hrs. maximum - average trip time) ^{2/}

Hours (nearest 1/4 hour)

a = Desired spacing between watercraft

.15 miles (792 feet)

h = Average time each watercraft is on the river (based on an average watercraft speed of 4 MPH and a 30-minute rest stop) determined as follows:

Hours (nearest 1/4 hour)

$$\frac{\text{Trip distance}}{4 \text{ mi./hr.}} + .50 \text{ hour rest period}$$

d = Number of available use days in the season ^{3/}

Days (est. 120)

CALCULATIONS

1. Forks to Bowman Bridge Segment

$$UV = \frac{12.6 \text{ miles} \times 5.25 \text{ hours}}{.15 \text{ mi./craft} \times 3.75 \text{ hrs./day}} \times 120 \text{ days} = 14,112 \text{ watercraft per year}$$

2. Bowman Bridge to Upper Branch Segment

$$UV = \frac{14.8 \text{ miles} \times 4.75 \text{ hours}}{.15 \text{ mi./craft} \times 4.25 \text{ hrs./day}} \times 120 \text{ days} = 13,233 \text{ watercraft per year}$$

3. Upper Branch to Walhalla Segment

$$UV = \frac{12.5 \text{ miles} \times 5.25 \text{ hours}}{.15 \text{ mi./craft} \times 3.75 \text{ hrs./day}} \times 120 \text{ days} = 14,000 \text{ watercraft per year}$$

41,345 Total carrying capacity

^{1/} Quantification of Connectives for the Recreation Goal of Techcom - L.S. Davis, Utah State University.

^{2/} Watercraft hours are 9 a.m.-6 p.m. If the trip time for a segment takes 3.75 hours then the last canoe could not be launched after 2:15 p.m. in order to be off the river by 6 p.m.

^{3/} Estimated season is mid-May until mid-September.

APPENDIX L

DESIRABLE CARRYING CAPACITY - PINE RIVER

ONE POSSIBLE REDUCTION SCHEDULE

NUMBER OF CANOES PERMITTED WITHIN N.F. BOUNDARY

	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>
Saturday	825	742	647	582
Sunday	737	663	597	515
Monday	*	300	300	300
Tuesday	*	0	0	0
Wednesday	*	300	300	300
Thursday	*	300	300	300
Friday	*	300	300	300

30% reduction in weekend use by 1980

*Weekday use for the 1977 season is estimated at 1,000 canoes per week and highly variable from day to day.

The above schedule would result in the following total potential canoe visits during 20 prime weekends from May 6 - September 17 and during 14 prime weekday periods from June 5 - September 8.

1977: Estimated at about 55,000 canoes (115,000 people).

1978: (20 Saturdays x 742 canoes) + (20 Sundays x 663 canoes)
+ (56 weekdays x 300 canoes) = 44,900 canoes (94,290 people).

1980: (20 Saturdays x 582 canoes) + (20 Sundays x 515 canoes)
+ (56 weekdays x 300 canoes) = 38,740 canoes (81,354 people).